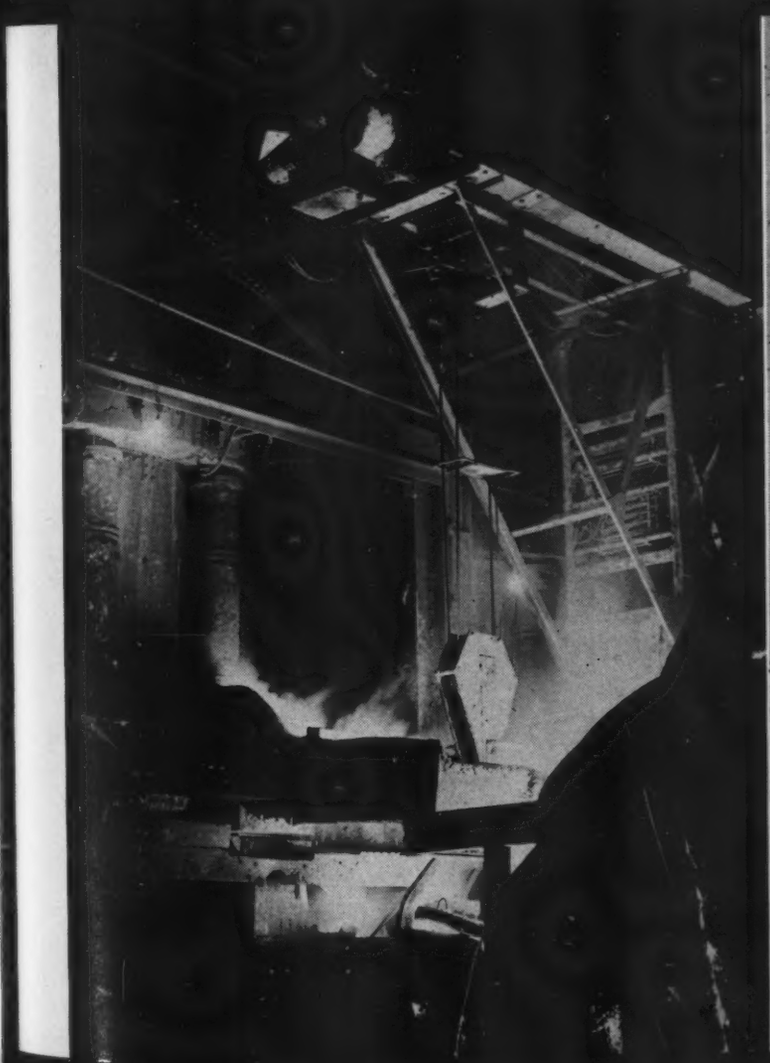
AUG 34 1941

American Foundryman



August
1941

The Association in the Industrial Defense Program

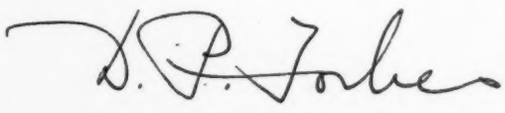
THE AMERICAN FOUNDRYMEN'S ASSOCIATION has entered a trying period of national defense preparation in an exceptionally strong position to be of great service. Our membership is the largest in our history, the past few years having added many members, with the prospect of many others availing themselves of the advantages of Association work and connections in the near future. Our activities, being carried on by the foremost men of the industry on national and chapter committees, are most extensive, and such a cooperative effort is a powerful force for the advancement of the industry.

Now, as never before, our Association and its chapters have an obligation to our members. We hope our chapters will give special attention to training problems, developing foundry workers, both technically and in the practical phases, by their regular chapter meetings and through educational courses.

While much of our technical committee work has been of such character that it fits naturally into any defense program, the committees this year are specifically directing their efforts on the defense problems confronting foundries. The finding of substitutes for metals and alloys presents problems which can be solved best by cooperative efforts. The question of how to surmount these problems will be discussed at chapter and national meetings.

Our publications, the Transactions, Quarterly, and Preprints, will answer many questions now arising and our past publications are worthy of careful study.

To advance the work of the Association, members are urged to assist the national membership committee in building the active membership to such size that it can be of even greater service to all branches of our industry, the steel, the malleable, the cast iron, the non-ferrous, the pattern, the equipment and supplies section, the managerial, the supervisory, the technical and shop worker groups, than it has in the past.



D. P. Forbes, Vice President, A.F.A.

Duncan P. Forbes, president and general manager, Gunite Foundries Corp., Rockford, Ill., Vice President of the Association, is chairman of the Association's Malleable Division, having served on various committees for many years and for three years as a director of the A.F.A.

A. F. A. Officers

President
H. S. SIMPSON*
National Engineering Co., Chicago, Ill.

Vice President
D. P. FORBES*
Gunite Foundries Corp.,
Rockford, Ill.

Board of Directors

Term Expires 1942

W. B. COLEMAN
W. B. Coleman & Co., Philadelphia, Pa.

C. R. CULLING
Carondelet Foundry Co., St. Louis, Mo.

O. A. PFAFF
American Foundry Equipment Co.,
Mishawaka, Ind.

MARSHALL POST
Birdsboro Steel Foundry & Machine Co.,
Birdsboro, Pa.

F. J. WALLS*
International Nickel Co., Detroit, Mich.

Term Expires 1943

G. W. CANNON*
Campbell Wyant & Cannon Foundry Co.,
Muskegon, Mich.

B. D. CLAFFEY
General Malleable Corp., Waukesha, Wis.

HAROLD J. ROAST
Canadian Bronze Co., Ltd., Montreal, P. Q.

L. P. ROBINSON
Werner G. Smith Co., Cleveland, Ohio

H. S. WASHBURN*
Plainville Casting Co., Plainville, Conn.

Term Expires 1944

R. J. ALLEN
Worthington Pump & Machinery Corp.,
Harrison, N. J.

J. G. COFFMAN
Los Angeles Steel Casting Co.,
Los Angeles, Calif.

W. J. CORBETT
Atlas Steel Casting Co., Buffalo, N. Y.

M. J. GREGORY
Caterpillar Tractor Co., Peoria, Ill.

L. N. SHANNON*
Stockham Pipe Fittings Co.,
Birmingham, Ala.

Staff

Executive Vice President and Treasurer
C. E. WESTOVER†*

Convention and Exhibits Manager
C. E. HOYT†

Secretary
R. E. KENNEDY†

Assistant Secretary
N. F. HINDLE†

Assistant Treasurer
J. REININGA†

†Headquarters
Room 1398, 222 West Adams St., Chicago, Ill.

*Members, Executive Committee

American Foundryman

CONTENTS

August, 1941

Volume 3 **Number 8**

	Page
The Association in the Industrial Defense Program, by *D. P. Forbes*	Inside Front Cover
Board Meeting Brings Leaders Together to Formulate Policies	2
1942 Convention and Foundry Show to Further National Defense	3
Wisconsin Honors Apprentice Winners	4
Foundry Control Methods in Making Uniform Cast Iron—I, by *E. K. Smith*	5
Three Chapters Cooperate in Purdue Regional Conference	10
A.S.T.M. Discusses Castings Specifications at June Meeting	11
Electric Furnace Melting—I, by *A. G. Gierach*	13
Chesapeake Aids in Defense Training Course	15
Chapter Directory	16
New Members	18
New Chapter Officers	19
Chapter Activities	20
1941 National Apprentice Contest Winners	25
Abstracts of Current Foundry Literature	26

Published by the American Foundrymen's Association, Inc., 222 West Adams St., Chicago, Ill., for the purpose of presenting Association and Chapter activities. Published monthly. Subscription price $1.00 per year. Single copies, 10c.

Entered as second class matter July 22, 1938, at the post office at Chicago, Illinois, under the Act of March 3, 1879.

Board Meeting Brings Leaders Together to Formulate Policies

THE annual meeting of the Board of Directors, held at the Palmer House, Chicago, July 15, brought together an outstanding group of leaders of the foundry industry to check on the Association's activities and to formulate policies to be followed in the near future. With President H. S. Simpson presiding, there were present 15 directors representing foundry centers of the west coast, the south, the east and central states, with Canada being represented by Harold J. Roast of Montreal.

The Association is fortunate to have such outstanding men, giving of their time and experience freely to direct the activities of this organization. President Simpson presented to the Board, C. E. Westover who on July 1 assumed the post of Executive Vice President. President Simpson then reviewed the policies he was advocating, presenting them under the following headings: (a) Organization, (b) Finance, (c) Technical Activities, (d) Publications, (e) Publicity and Dramatization of Castings, (f) Membership, (g) Distribution of Information, (h) National Defense, (i) Apprentice and Foreman Training, (j) Chapters, (k) Foreign Activities, and (l) Safety and Hygiene.

Membership

C. E. Hoyt then reported as Executive Vice President for 1940-41 showing that during the past year a great increase in membership had been secured, the Association having as of July 1, 4168 members, a net gain of 23 per cent over the membership a year ago. This number is a record high, the records showing a steady growth since the post depression low in 1933. Of the present membership 3533 or 85 per cent are members in chapter territories, with 471 outside of chapters in the United States. The following table shows the membership by classes:

Honorary and Life	46
Sustaining	86
Company	1044
Personal	827
Personal-Affiliate	1948
Personal-Associate	158
Student	20
Apprentice	39

Mr. Hoyt also stated that the budget estimate for 1940-41 had been met, both as to income and expense.

1942 Foundry Exhibition

Mr. Hoyt also reported as convention and exhibit manager, the position he retains in the organization since relinquishing the duties of Executive Vice President. He announced that plans for a major foundry exhibit for 1942 had been completed, with the Cleveland Public Auditorium and Convention Hall being secured to house the convention and display of Foundry and Allied Industries Show. Further plans for the 1942 exhibit are given elsewhere in this issue.

Chapters

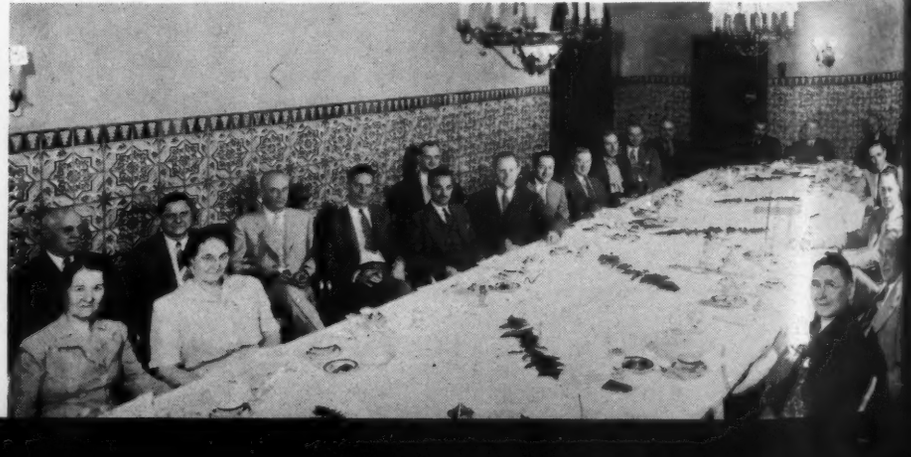
The report of the secretary showed that there are now 21 chapters of the Association, the following having been added this past year, the Chesapeake (Maryland and Virginia), the Western Michigan (Muskegon-Grand Rapids area) and the Twin City (Minneapolis-St. Paul, Minn., area). While the future offers possibilities of some other chapters being organized, the Toledo, Ohio, district is definitely going ahead with plans for a chapter formation this fall.

The total attendance at regular chapter meetings this past year has been about 20,000 and to this should be added the several thousand attending regional meetings and chapter outings.

Publications

An extensive publication program was approved following a report presented by Assistant Secretary Hindle. In addition to the regular publications, Transactions, preprints and *American*

The Board of Directors meeting brought together leaders of industry from all sections of the country on July 15. Directors and guests shown are (reading left to right): Miss P. Mockler, Chicago A.F.A. staff; J. G. Coffman, Los Angeles Steel Casting Co., Los Angeles, Calif.; Miss Jennie Reininga, A.F.A. Assistant Treasurer; L. N. Shannon, Stockham Pipe Fittings Co., Birmingham, Ala.; G. W. Cannon, Campbell Wyant & Cannon Foundry Co., Muskegon, Mich.; O. A. Pfaff, American Foundry Equipment Co., Mishawaka, Ind.; E. O. Jones, Belle City Malleable Iron Co., Racine, Wis.; N. F. Hindle, A.F.A. Assistant Secretary; Vice President D. P. Forbes, Gunite Foundries Corp., Rockford, Ill.; L. P. Robinson, Werner G. Smith Co., Cleveland, Ohio; C. E. Hoyt, A.F.A. Manager of Exhibits; R. J. Allen, Worthington Pump & Machinery Corp., Harrison, N. J.; F. J. Walls, International Nickel Co., Detroit, Mich.; C. E. Westover, A.F.A. Executive Vice President; L. Corcoran, General Motors Corp., Detroit, Mich.; President H. S. Simpson, National Engineering Co., Chicago, Ill.; Harold J. Roast, Canadian Bronze Co. Ltd., Montreal, Canada; W. J. Corbett, Atlas Steel Casting Co., Buffalo, N. Y.; B. D. Claffey, General Malleable Corp., Waukesha, Wis.; W. H. Doerfner, Saginaw Malleable Iron Div., General Motors Corp., Saginaw, Mich.; W. B. Coleman, W. B. Coleman & Co., Philadelphia, Pa.; H. Wanzell and J. Clevenger, Sound Masters Corp., New York, N. Y.; D. J. Reese, International Nickel Co., New York, N. Y.; R. E. Kennedy, A.F.A. Secretary; and C. R. Culling, Carondelet Foundry Co., St. Louis, Mo.



Foundryman, this coming year should see the publication of a new book on *Core Practice and Theories*, and the first revised edition of *Alloy Cast Irons*, while a start on the third edition of the *Cast Metals Handbook* will be made with the book being issued in 1943. Another book being started will cover *Cupola Practice and Operation*, a project of the Cupola Research Committee.

Technical Activities

Director Fred J. Walls, reported as chairman of the Board committee on Technical Activities. Some 300 members are serving on these committees which, in addition to the five divisions, gray iron, steel, malleable, non-ferrous and patternmaking, cover research developments and education on such phases of the industry as sand research, apprentice and foreman training, refractories, job evaluation and time study, plant and plant equipment and cost methods. Mr. Walls stressed the need at this time of publicizing available casting and metal specifications, especially those of the American Society for Testing Materials with which the A.F.A. is cooperating. For the 1942 convention these committees, in preparing the program for the meeting, will stress papers dealing with defense production problems as affecting foundry operations and control. By Board action, H. Bornstein, Deere and Company, Moline, Ill., past president of the Association and former chairman of the Technical Activities Correlation Committee, was elected a member of Mr. Wall's committee, serving with Directors W. J. Corbett, R. J. Allen and Vice President D. P. Forbes.

Safety and Hygiene

The Board accepted with regret the resignation of E. O. Jones who for several years has acted as director of the Safety and Hygiene Section. Mr. Jones returns to work with his former employer, the Belle City Malleable Iron Co. and Racine Steel Casting Co. The work of the Safety and Hygiene Section will be continued actively by the A.F.A. Industrial Hygiene Codes Committee of which James R. Allan of the International Harvester Co. is chairman. The very valuable work of this committee during the past few years in developing recommended good practice codes on safety and sanitation was especially commended. Mr. Jones will continue as a member of this committee.

Publicity on Castings

President Simpson stated that as the dramatization of castings and the promotion of interest in the foundry industry on the part of the general public was foremost in his thoughts, he had appointed a committee to survey the possibilities and to report on ways and means of carrying out such a program. The committee appointed by President Simpson is under the chairmanship of William J. Grede, president, Grede Foundries, Inc., Wauwatosa, and serving with him are:

A. C. Denison, Fulton Foundry & Machine Co., Cleveland, Ohio.
W. H. Doerfner, Saginaw Malleable Iron Div., General Motors Corp., Saginaw, Michigan.
D. P. Forbes, Gunite Foundries Corp., Rockford, Illinois.
M. J. Gregory, Caterpillar Tractor Co., Peoria, Illinois.
J. Lammering, Hammond Brass Works, Hammond, Indiana.
O. A. Pfaff, American Foundry Equipment Co., Mishawaka, Indiana.
D. J. Reese, International Nickel Co., New York City.
L. P. Robinson, Werner G. Smith Co., Cleveland, Ohio.
James Suttie, American Steel Foundries, Chicago, Illinois.

Mr. Doerfner as chairman of a subcommittee, with A. C. Denison and D. J. Reese as members, reported that his committee had reviewed the possibilities and costs of producing an educational film portraying the highlights of the foundry and castings use. The outline for such a film as prepared by educational film producers was presented and the Board expressed approval of the project, requesting the general committee to present plans for a definite program of publicizing the industry and of methods of financing such a program by the combined efforts of those interested in castings manufacture. The chairman of the finance subcommittee for the project was announced as Director L. P. Robinson, Werner G. Smith Co., Cleveland.

1942 Convention and Foundry Show to Further National Defense

THE Executive Committee of A.F.A., at their July 14 meeting, considered plans for the 1942 Foundry and Allied Industries Show to be held in conjunction with the 46th Annual Convention.

Their recommendations to the Board of Directors on July 15, which were unanimously approved, included the following resolution:

Whereas one of the primary purposes of staging exhibits at conventions of the American Foundrymen's Association is to provide nation-wide opportunity for users of equipment and materials to conserve their time and cost in keeping step with progress in these fields, and

Whereas under present conditions the users of these materials are confronted with an increasing number of problems in production demands, particularly in connection with important defense work, problems which can more readily be solved through exchange of ideas and experiences for which a convention and show provide unusual opportunities, and

Whereas these conditions place special responsibility upon those who conduct these events, therefore, be it

Cleveland Public Auditorium where the 46th Annual A.F.A. Convention and Foundry and Allied Industries Show will be held.

Resolved by the Board of Directors of the American Foundrymen's Association that the exhibit be staged in conjunction with the annual convention of the Association in Cleveland, April 18 to 24, 1942, be planned with a view to furthering the National Defense Program, and be it further

Resolved that the co-operation of the U. S. Government be solicited in staging exhibits of defense equipment and materials manufactured by the foundry and allied industries, and that the Board of Directors of the American Foundrymen's Association authorize making available, gratis, suitable and sufficient exhibit space for exhibits by the Army, Navy and other Government departments, engineering schools, associations and societies for educational exhibits that will aid in achieving these objectives.

Plans are already under way for securing Government, engineering school and society exhibits, in line with the above resolution, that will supplement commercial exhibits at what gives promise of being the largest, most informative and interesting Foundry Show ever staged.

All companies exhibiting at previous Foundry Shows will receive soon formal announcement of this coming event and space application form. They and all prospective new exhibitors should keep in mind convention dates in planning their advertising and exhibit schedule for 1942.

Wisconsin Honors Apprentice Winners

AT A RECENT meeting of the Wisconsin Chapter homage was paid to the "local boys who made good"—the apprentices who won places in their local and the Association's National apprentice contest. This gesture, on the part of the chapter, has become an annual affair and has helped apprentices feel that there is a place for them in chapter and Association activities.

However, the chapter feels, through the sponsoring of the local apprentice contest, that they are accomplishing a two-fold objective. They are creating a competitive spirit among the boys of their district and, above all, are showing employers the type of worker they are training for new positions during this national emergency. Each year, through this competitive spirit, the contests, both locally and nationally, are becoming keener and keener. The four division judges of both contests will agree to that. The standard of workmanship that has been established by the numerous participating apprentices has been extremely high. So all employers, whether they possess winners or not, should be proud of their apprentices.

The boys in the chapter vicinity must have decided at the opening gun that they were not going to be outclassed by any other section of the country because they ran off with three prizes in the National apprentice contest. They nearly swept the Non-Ferrous Division when Tony Ivancich, Standard Brass Works, took first place and Kenneth Zinda, Allis-Chalmers Mfg. Co., polished off third place honors. In the Steel Division, another Wisconsin boy, Harry Novak, Maynard Steel Casting Co., captured second place.

Local contest winners were:

Patternmaking:

First — Marvin Bergstrom, Kearney & Trecker Corp.
Second—Elroy Kuehn, Allis-Chalmers Mfg. Co.
Third—Charles Tomasicyk, Allis-Chalmers Mfg. Co.

Non-Ferrous:

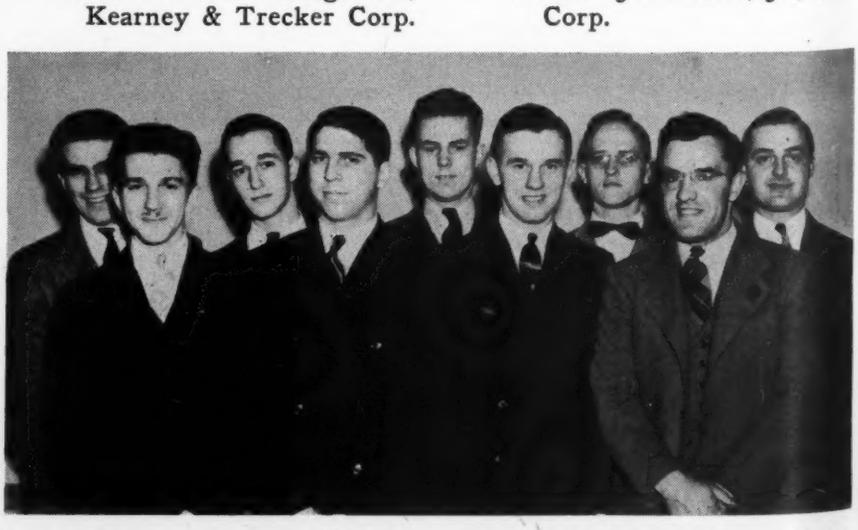
First—Kenneth Zinda, Allis-Chalmers Mfg. Co.
Second—Tony Ivancich, Standard Brass Works.
Third—Steve Garbowicz, Allis-Chalmers Mfg. Co.

Gray Iron:

First—Leonard Hahn, Allis-Chalmers Mfg. Co.
Third—Steve Garbowicz, Allis-Chalmers Mfg. Co.

Steel:

First—Harry Novak, Maynard Steel Casting Co.
Third—Joe Leifer, Jr., Falk Corp.



Local and national apprentice winners at a recent meeting of the Wisconsin Chapter. Back row (left to right): Steve Garbowicz, Tony Ivancich, Marvin Bergstrom, Kenneth Zinda and Elroy Kuehn. Front row (left to right): Joe Leifer, Jr.; Leonard Hahn, Harry Novak and Charles Tomasicyk.
(Photo courtesy John Bing, A. P. Green Fire Brick Co.)

Foundry Control Methods In Making Uniform Cast Iron—I

By E. K. Smith, Detroit, Mich.

The author, who is metallurgist, Electro Metallurgical Co., Detroit, Mich., presented the following paper before the Regional Conference of the Southern and Northern California Chapters, May 22, during the Western Metals Congress. This paper outlines some of the foundry control methods now being used in making good castings, particularly by the cupola process. This, the first of three sections, touches briefly on the control of raw materials; such as pig iron, coke, steel scrap, briquetted alloys, and cast scrap, in the cupola charge. The author also presents informative data concerning cupola operation and discusses new developments in dry and balanced blast. The value of chill testing and the various types used in the industry are commented upon.

IT is a fine thing to make a perfect gray iron casting, but it is much better—and much more difficult—to make a thousand perfect castings. At the present time, the production of perfect castings in large quantities is of vital importance. The quality of gray iron has been improved enormously, due to the use of steel scrap and alloys, during the past decade or two. However, we all have been familiar with occasional lapses in our production of good castings. For instance, a sudden epidemic of "shrinks," or unmachinable castings, or "blows," or leaks or "cold-runs." Usually such troubles had no obvious cause. All the raw materials were unchanged, the cupola operation was perfect, sand as usual, but we suddenly ran into a lot of scrapped castings.

The object of this paper is to outline some of the foundry control methods now being used, in promoting uniformly good castings, particularly in the cupola process. It is not the general average of the castings that determines the efficiency of succeeding operations, but the level of the worst castings. For example, machining speeds must be set up for the hardest castings, not for the average. If 90 per cent of the castings meet a Brinell specification of 182-196, and the other 10 per cent run 228 Brinell, speeds are set accordingly, and there is a decided loss in machine production on 90 per cent of the product.

The production of castings is made up of hundreds of variables. By eliminating many of these variables, and getting the others under control, foundries are able to produce uniformly excellent castings. A number of the more important variables, and the methods used in their control, are considered later. In starting, it must be emphasized that it is absolutely necessary to keep accurate records of items affecting the uniformity of the castings, then set up simple standards, and—hardest of all—see that the standard instructions are followed, every day.

Raw Materials

Pig Iron

Pig iron is the foundation of the gray iron casting industry, and it is often the first thing to be blamed, in case of trouble. Undoubtedly, there have been cases where poorly made pig has caused difficulty, but the writer cannot remember any scrapped castings which could be definitely traced to defective pig. Usually, it developed that some other variable was to blame. However, many melters are certain that particular brands of pig iron give certain results as to chill, strength, structure and other characteristics. The writer is convinced that there is some foundation for this "hereditary" effect from pig through the cupola, to the gray iron castings. Results reported by Joseph and Boegehold[1] and others certainly confirm this idea.

In any case, wherever possible, it is better to have two or more brands of pig in the mixture so as to compensate for any fluctuations in blast furnace practice. Above all, it is not desirable to switch the entire pig content of the mixture from one brand to another, if uniform castings are essential.

Cast Scrap

The old idea that good castings cannot be made with "bought" scrap in the mixture has been abandoned. This idea grew up from the use of poorly sorted scrap, often containing harmful materials. Another source of trouble was due to the fact that large amounts of scrap were melted without regard for sulphur build-up in the remelt, or the sulphur-manganese ratio. Where a reasonably good grade of scrap is available, and proper precautions taken in its use, large proportions of scrap can be melted without lack of uniformity in the castings.

The government specifications for scrap* are practical, and can often be used to advantage. It is hardly necessary to emphasize that bad materials such as burned grate bars should not be used. Badly oxidized iron or steel results in excessive hardness, as it reduces carbon and silicon in the iron, and probably has other harmful effects. It has been found very helpful to have a man inspect and sample every lot of scrap, then have the sample analyzed. The inspector in this way becomes familiar with

[1]Superior numbers refer to bibliography at end of paper.

*"*Classification of Iron and Steel Scrap,*" Simplified Practice Recommendation R58-36, Superintendent of Documents, Washington, D. C. Price 5 cents.

the analyses of different types of cast iron and in a short time he becomes quite an expert in estimating the average analysis of any type of cast scrap. Nonferrous metals such as brass should be thrown out if in appreciable quantities.

Steel Scrap

This type of scrap is, of course, used in enormous quantities in the cupola. The standard type for cupola use has been short lengths of steel rails. These are uniform in size and analysis and are preferred in several processes. However, in the present emergency, the writer feels that other types of steel scrap give satisfactory results and can be used in most cases. Personally, the writer likes structural steel scrap covered by a suitable specification, particularly because it is lower in carbon than steel rails and, therefore, probably gives slightly lower carbons in the castings.

For some years, light steel sheet was very unpopular for cupola use, but at the present time clean sheet steel is made into very compact bales which are melted successfully. The size and weight of these bales should be proportioned to the size of the cupola. The writer prefers bales of about 100 lb. In some cases, excessively large bales up to 1400 lb. have been used with poor results.

Briquetted Alloys

With the modern tendency towards using large proportions of steel or cast scrap it has been necessary to supply silicon and manganese in order to balance the mixture. Sufficient amounts of these alloys may be found in the pig iron, but frequently briquetted ferro-alloys are used. From the standpoint of uniformity, alloy briquets have many advantages. As the alloy content is accurate in each briquet, they are simply counted, and this eliminates a weighing operation. The writer's experience has been that briquetted alloys are decidedly valuable in the production of more uniform iron.

Coke

Good gray iron castings can be made with practically any type of coke, but it is desirable to obtain the coke which gives best results for the particular type of castings being produced. Some cokes result in high carbon in the castings, while other cokes tend towards a much lower carbon pickup by the iron. In any case, it is better to obtain one grade of coke and avoid changes in source of supply. Complete details covering different types of coke are contained in a paper by Mulcahy[2] in *American Foundryman.*

The Cupola

Written Instructions

Written instructions are essential in the production of uniform castings in any type of equipment. It is realized that many foundrymen carry all the details in their heads, but it is far better to have these instructions written out in logical order and available to the operating man or men.

Tuyeres

Tuyeres can be of any type from the simplest to the rather complicated rows used in the balanced blast process. For the small foundry, the writer likes the simplest possible tuyeres of continuous type, one row only, the area of the tuyeres at the shell to be 25 per cent that of the cupola bottom.

Gauges

Gauges to measure pressure and volume are inexpensive and simple to operate, and can be used to advantage on every cupola.

Ladles

Mixing ladles are standard equipment in most foundries, and are a very important item in the production of uniform castings. This is especially true where materials of widely different composition are melted. For instance, should half the charge be scrap steel containing 0.03 per cent phosphorus and the other half the charge be southern pig iron containing 0.75 per cent phosphorus, and the steel melts considerably later than the pig iron, there would obviously be every opportunity for fluctuation in analysis unless the resulting melt has a good opportunity to mix. (Where considerable iron is held in the cupola, the opportunity to mix is much better than where a front slag device is used and the metal runs out as fast as it melts.) It is better to have a forehearth, or mixing ladle, which will hold at least one charge of iron, preferably more. The better opportunity the different constituents in the iron have to mix, either in the cupola or in the ladle, or both, the more uniform will be the properties of the castings.

Weighing Scales

Scales are an essential part in the modern foundry, and, due to the very rough treatment they necessarily meet, they sometimes get out of order and become a source of fluctuation in the iron. However, where scales are checked at least once a day by the use of standard weights, this source of error is minimized. Standard weights are easily obtained, and it involves only a few minutes to check any type of weighing equipment. It is not necessary to wait until the end of the day's run. Any experienced cupola man may notice that more or less than the usual amount of any raw material is going in the cupola, and this should call for a rapid check on the weighing equipment. The same check is indicated should there be an unexplained variation in the temperature or chilling property of the iron as it comes from the cupola.

Extra Equipment

There are many new types of cupola equipment which are used mostly in the larger production foundries, and which have been of great assistance in the production of more uniform castings, especially where the specifications are very narrow, or the raw material is not uniform.

Combustion Control

Combustion control has received a good deal of attention in recent years and, in particu-

lar, much work has been done on the ratio of CO to CO_2 in the exhaust gases of the cupola. This was covered in some detail by Massari[3] in *The Foundry*. Massari got maximum efficiency at 13 per cent CO_2, but other operators of similar equipment have found optimum figures ranging up to 19 per cent. It also has been found that the lower the CO_2 in the exhaust gases, the higher will be the carbon in the iron. Massari found CO_2 11.5 per cent gave carbon 3.75 per cent in the castings, while CO_2 15 per cent gave carbon 3.45 per cent in the castings. Without doubt, CO_2 control equipment is helpful to the cupola operator in obtaining closer control of the castings.

Weighed Air

Weighed air is of assistance in the production of uniform castings. It is quite important to weigh air, just as the coke or iron going into the cupola, as actually the air going into the cupola weighs more than all the solid materials. The ordinary type of blower equipment furnishes a definite volume of air, but the combustion of coke depends on the weight of oxygen furnished, and this, in turn, varies according to the atmospheric pressure and temperature of the air.

Obviously the control of the amount of oxygen forced into the cupola has an important bearing on the production of uniform castings. If too much oxygen is furnished, the iron may be "burned" and the castings are unsatisfactory. If too little oxygen is furnished, the iron will be too cold to pour. In using weighed air equipment, it is desirable to set the controls at a definite number of pounds of air per minute, and not make any changes unless absolutely necessary. The equipment automatically compensates for differences in temperature and pressure of the air, so that a constant weight of air is delivered to the cupola.

Dry Blast

Dry blast is one of the important recent developments in cupola equipment. Foundrymen have reported for years that their castings had different physical properties, particularly machinability, in the summer than in the winter. It also has been reported that chilling capacity of the iron is higher on moist days than during dry weather. Working on the idea that the water in the air dissociates and causes an absorption of hydrogen in the castings, experiments were run some years ago which showed that comparatively dry air gave much more uniform iron. This is understandable, when one figures that to melt a ton of iron the air blast will contain from 9 lb. water (1 gall.) in very dry weather to 50 lb. water (6 gall.) in very wet weather. J. L. Brooks[4] in *The Foundry* describes a recent installation in which a lithium chloride solution is used to give a uniform moisture content in the blast. The foundry in question manufactures piston rings, and it was found that the small hard spots of carbides which occasionally gave difficulty were eliminated when the blast was dried. In this particular installation, the blast is not only dried but also heated. It is stated that moisture varies from 2 to 12 grains per cu. ft. of air, according to weather conditions. In this foundry, they find it satisfactory to hold the moisture at 3 grains per cu. ft. by means of the automatic equipment. The lithium chloride solution reduces the moisture of incoming air to this figure. If the outdoor air is lower than 3 grains, moisture is automatically run into the air blast, in order to bring it up to the standard figure of 3 grains. Other foundries find that 4 or 5 grains may be more suitable for their type of work. It is felt that if moisture can be held to any stated figure throughout the year, fluctuations in the quality of the castings are greatly reduced.

Balanced Blast

Balanced blast equipment was developed some years ago in England, where it is used very widely. The idea is to supply a soft blast for the coke bed so that CO will be formed. The upper tuyeres are adjusted so as to burn the gases to CO_2. It is stated that a balanced blast operation has effected a remarkable increase in uniformity of the castings. Tables 1 and 2, shown here, are taken from an article by S. E. Dawson[5], *Foundry Trade Journal*. Note, in Table 2, the improvement in cupola efficiency by use of the balanced blast.

Cupola Operation

It is outside the scope of this paper to go into the intricate details of cupola operations which have been covered in many previous papers. However, it may be interesting to touch on some of the points in cupola melting which concern the uniformity of the castings, or rather, their occasional lack of uniformity. Many of these points seem extremely elementary, but

Table 1

Influence of Air to Coke Ratio on the Rejections

Test No.	Air (Cu. Ft.) Per Lb. Coke	Rejections (Per Cent.)
1	233	11.0
2	197	8.7
3	183	8.0
4	179	6.8
5	164	1.3
6	165	1.0

Table 2

Chart Illustrating Improvement in Cupola Efficiency Through the Use of Balanced Blast

Gases	Normal Cupola, Per Cent.	Balanced Blast Cupola, Per Cent.	Complete Combustion, Per Cent.
Carbon dioxide	12.8	18.5	20.7
Carbon monoxide	8.9	1.4	0.0
Oxygen	0.4	0.6	0.0
Nitrogen	77.9	79.5	79.3

their neglect causes serious changes in the properties of the castings.

Some Routine Checks

1. Inspect the cupola lining from the previous day's run, to determine whether there was any abnormal operation.
2. Check the weighing scales.
3. Inspect raw materials to be used that day, especially the scrap.
4. See that the wood is of reasonable size, properly placed on the sand bottom and thoroughly lighted.
5. See that the first coke is thoroughly lighted.
6. Bring the bed up to standard height. The height of bed is of the greatest importance. The best height can be determined experimentally by starting at some arbitrary figure, say 42-in., and increasing or decreasing the height, as the case may be, day by day until good hot iron comes down every day. The height of the bed depends a good deal on the blast pressure, and personally, when experimental work is not possible, I prefer a 50-in. bed. (It is as well to check the measuring rod occasionally, as sometimes parts of it are lost.) The preparation and lighting of the bed is one of the most important operations in the production of uniform castings. If the bed is not at the correct height or improperly lit, faulty castings are certain to result. This work is sometimes slighted, as laying the bed and putting in the first charges is often done in the middle of the night when the day supervisor is not present.
7. Start making chill tests with the first ladle and continue during the entire run.
8. Avoid shut-downs and changes in speed of melt as much as possible. When a shut-down is necessary, add extra coke to take care of the burning out the bed.
9. Avoid special charges during the day's run. If possible, run special charges the last thing. Pour off regular floors, drain cupola, build up bed, put in special charges and melt as usual. Where a few special charges are run between regular iron, dilution of the special iron may give disappointing results. To take an extreme case, suppose 1,000 to 2,000 lb. of iron is held in cupola hearth. Then suppose one charge (1,000 lb.) contains 1 per cent of alloy. If the alloy charge melts all at once, the alloy in the hearth iron may be about 0.50 per cent. It will be diluted by following charges as they melt. In this case the maximum alloy in the castings will be 0.50 per cent, dropping gradually by dilution to 0 per cent. If two charges of special iron are melted, the maximum amount of alloy will be higher and so on. Personally, the preference of the writer is to charge not less than 5 special charges, unless at the end of the day.
10. Have the best man available on the charging floor. He can contribute greatly to the uniformity of the castings.
11. Watch the slag during the day's run. If the slag is very black, it is high in oxides, and may mean that there is excessive blast or oxidized material in the charge. A white or gray slag usually indicates too much lime rock, and this should be reduced.
12. Keep records of all the factors entering into the metal operation. These may be very simple in a small foundry or extremely complicated in the large production shops. It is best to put on record hourly all the variables, for instance, blast pressure, blast volume, rate of melt, shut-downs, temperature of iron, pouring conditions, cold runs, analyses, depth of chill, condition of sand, and other important information.

No matter how much or how little equipment is used in cupola operation, the final results depend on the men doing the melting and on standardized methods. This has been pointed out very clearly by R. E. Shadwick[6] in *The Foundry*.

Wherever possible, have one man who simply follows up the uniformity of the castings. One per cent of scrap may cost the foundry many thousands of dollars a year. (In several of the smaller plants it was determined that 1 per cent of scrap cost $5,000 a year.) A man who can follow up uniformity in all its phases is often a very good investment, even though his duties are only to watch all the phases entering into uniformity of the castings and to report current conditions to those directly responsible.

Chill Test

Years ago, tests were devised for determining the chilling capacity of iron. In most cases, a test bar was cast against a metal surface and the depth of chill determined the hardening capacity of the iron. The large size chill test has been used by the car wheel companies for many years, but this test has been adapted for control purposes in gray iron foundries and is now being used in a number of shapes.

To the author, the chill test seems the most important method of controlling the uniformity of the castings. The test is rapid, inexpensive, can be adapted to any type of iron, and gives the needed information almost instantly. Chemical analysis will give the ultimate composition of the cast iron but, necessarily, it takes some time to run the analyses. The microscope will show the ultimate structure of the iron, but here again, more time is necessary. The ordinary chemical analysis covers the ordinary elements, say, silicon, manganese, carbon, sulphur and phosphorus. It does not cover stray elements or oxidation, which may affect the physical properties of the castings more than the ordinary elements. The chill test gives a sort of birds-eye view of all the characteristics of the iron. It takes into account all the chemical elements, the melting condition of

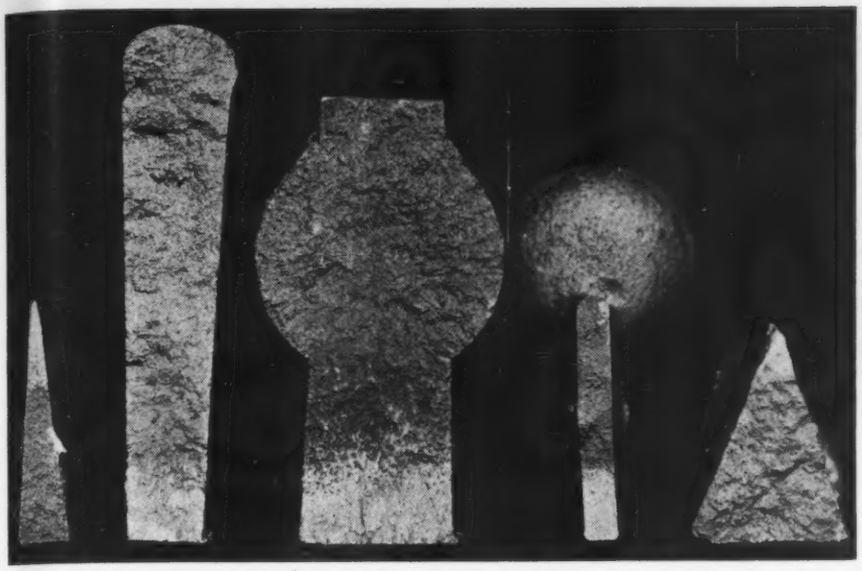


Fig. 1—Chill test samples used by production foundries.

the cupola, the presence of stray elements and, in fact, everything that goes to make up the quality of the iron.

Chill Test Denotes Changes

If the iron suddenly becomes hard in the middle of the day's run, this would not be detected by chemical analysis for some time, but the chill test would announce the change in hardness as soon as the iron came from the cupola. Chills should run quite uniform; but supposing that the chill gradually increases in depth. At once the operator knows that something is going wrong, possibly that the bed is getting too low, and he acts accordingly. On the other hand, if the chill becomes too low, the operator can see at once that the variation is corrected in the mixture before it gets to be serious.

If the chills fluctuate from high to low, the chances are that some very non-uniform material is being charged in the cupola, and this can be checked into at once. The chills have the additional advantage that any variation in the quality of the iron cannot only be corrected at its source, that is, in the cupola charges or operation, but also an immediate correction can be made by means of ladle additions until the iron gets back to normal. This phase of uniformity control will be considered later.

Types of Chill Tests

Fig. 1 shows some of the chill tests in constant use in production foundries. On the extreme left is a "V" test which gives great variation in chill, due to its acute angle and quick cooling rate. Next is the straight chill test used in some automotive plants. Due to its light section, it can be broken with little delay. In the center is the conventional key-hole test used in many of the automotive plants. The depth of chill shows whether the light edges of the castings will have the proper degree of machinability, and indicates the Brinell hardness in the bore. It is astonishing how accurately the skilled operator can estimate from the depth of chill what will be the Brinell hardness on the larger section of the keyhole test, and on the top of the cylinder bore poured from the same ladle. This bar is enlarged on the upper side in order to give a slower cooling rate. Here again, the experienced operator can read a lot from the structure of this heavier section. For instance, a coarse structure in the center usually means that the carbon in the iron is running on the high side. This type of test was described in detail in an article by A. H. Dierker[7] in *American Foundryman*. On the right of the keyhole is the very thin test used by makers of extremely light gray iron castings, such as piston rings. The round part shown above is simply a small pouring basin, while the white section poured against a chill gives a very accurate idea of the hardness of the piston rings. Incidentally, the chilled area in this small test can be held almost constant throughout the day through use of good control methods. On the extreme right is the conventional "V." The upper edge shows a very light chill. This is often used in connection with the keyhole test. The "V" can be broken almost instantly, while it necessarily takes a keyhole test several minutes to cool. The "V" test can be poured, cooled, broken and inspected inside of 30 seconds. For all-around control work, the writer prefers the use of the keyhole test and the "V" test on the extreme left, both poured at the same time.

The depth of chill on these tests, of course, depends on the nature of the iron. Machinable soft iron used for light castings often has a chill of about 1/32-in., while the harder type of iron used for motor blocks may have from ¼ to ½-in. chill.

Still another type of test which is used in some foundries pouring fairly heavy castings is the familiar sprue test used by many of the malleable foundries. This bar is easy to make and offers quick information. Some fractures are shown in Fig. 2.

This test is made by simply ramming some molding sand in

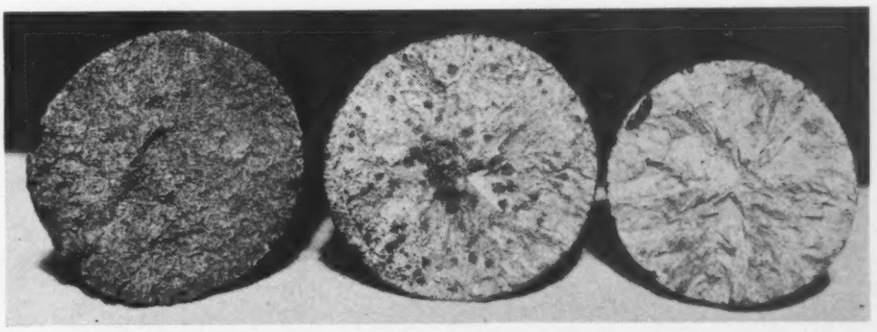


Fig. 2—Sprue test samples used by many malleable foundries.

a box or an old ladle, then forcing down a round pattern or stick or broom handle. The size may range from 1-in. to 2½-in., according to the type of iron being tested. On the left is the bar poured with gray iron mixture suitable for heavy castings. In the center is a bar, which might represent either malleable iron on the soft side or low silicon gray iron. On the extreme right is shown a malleable hard iron which is completely white.

(To Be Continued)

Three Chapters to Cooperate in Purdue Regional Conference

THE Michiana, Central Indiana and Chicago Chapters are co-operating in staging a regional conference at Purdue University, West Lafayette, Ind., October 17-18. Committees of these chapters have been co-operating since early in the year and held a meeting in April at Purdue University for the purpose of discussing program arrangements. An effort is being made to secure speakers who will discuss the shifts and possible substitution of materials made necessary because of shortages. The conference program is being built around this idea and includes subjects of operating interest. The general committee in charge of the conference is as follows:

Chairman: J. D. Burlie, Western Electric Co., Chicago—*Chicago Chapter.*

Secretary: E. F. Ross, *The Foundry,* Chicago—*Chicago Chapter.*

L. C. McAnly, Rockwood Mfg. Co., Indianapolis, Ind.—*Central Indiana Chapter.*

L. H. Rudesill, Griffin Wheel Co., Chicago — *Chicago Chapter.*

G. B. Stantial, Illinois Malleable Iron Co., Chicago—*Chicago Chapter.*

H. W. Johnson, Northwestern Foundry Co., Chicago—*Chicago Chapter.*

G. P. Phillips, International Harvester Co., Chicago—*Chicago Chapter.*

M. F. Doty, Clark Equipment Co., Buchanan, Mich.—*Michiana Chapter.*

W. A. Schlosser, Argos Foundry Co., *Plymouth, Ind.*—*Michiana Chapter.*

W. A. Knapp, Purdue University, West Lafayette, Ind.—*Purdue.*

J. W. Bray, Purdue University, West Lafayette, Ind.—*Purdue.*

C. W. Beese, Purdue University, West Lafayette, Ind.—*Purdue.*

A. W. Gregg, Whiting Corp., Harvey, Ill.—*Chicago Chapter.*

B. E. Gavin, National Malleable & Steel Castings Co., Indianapolis, Ind.—*Central Indiana Chapter.*

George E. Stoll, Bendix Aviation Corp., South Bend, Ind.—*Michiana Chapter.*

H. B. Harvey, Indiana Foundry Corp., Muncie, Ind.—*Central Indiana Chapter.*

C. E. Westover, Exec. Vice Pres., American Foundrymen's Assn., Chicago—*Chicago Chapter.*

The general committee has appointed division committees responsible for programs of interest to the non-ferrous, steel, gray iron and malleable divisions of the foundry industry. A. W. Gregg, Whiting Corp., Harvey, Ill., is chairman of the Steel Division program; H. W. Johnson, Northwestern Foundry Co., Chicago, chairman, Gray Iron Division program; B. E. Gavin, National Malleable & Steel Castings Co., Indianapolis, chairman, Malleable Division program, and George E. Stoll, Bendix Products Div., Bendix Aviation Corp., South Bend, Ind., chairman, Non-Ferrous Division program.

It is planned that on Friday evening, October 17, a joint dinner meeting of the three chapters will be held. H. B. Harvey, Indiana Foundry Corp., Muncie, Ind., chairman of the Central Indiana Chapter, is the chairman of this committee.

Plans also have been made with Purdue University for a student meeting and the chairman of this committee is C. E. Westover, executive vice president, American Foundrymen's Association, Chicago. Co-operating with Mr. Westover are J. W. Bray, head, Chemical Engineering School; C. W. Beese, head, General Engineering School; H. L. Solberg, head, School of Mechanical Engineering; E. S. Ault, professor of machine design, and R. E. Wendt, foundry instructor; all of Purdue University.

The chapters are working in co-operation with W. A. Knapp, assistant dean of engineering of the University.

A View of Purdue University's Campus.

A. S. T. M. Discusses Castings Specifications at June Meeting

AT the 44th annual meeting of the American Society for Testing Materials held at the Palmer House, Chicago, June 23-27, 1941, many committee reports and specifications of interest to the foundry industry were discussed. Probably the largest number of new specifications promulgated for any one section of the foundry industry was the group presented by Committee B-5 on Copper and Copper Alloys, Cast and Wrought. The work on these tentative specifications was done by Subcommittee X under the chairmanship of A.F.A. Past President G. H. Clamer, Ajax Metal Co., Philadelphia. Your Association is officially represented on this committee by F. L. Wolf, Ohio Brass Co., Mansfield, Ohio.

Non-Ferrous Specifications

The new specifications cover alloys as classified in Tentative Specification B119-40T covering the Classification of Copper Base Alloys adopted by the A.S.T.M. last year. The specifications of interest to foundrymen that have been approved as Tentative Standards are as follows:

1. *Tin Bronze and Leaded Tin Bronze Sand Castings.* This specification replaces immediately the Standard Specifications for Castings of the Alloy: Copper, 88 Per Cent; Tin, 8 Per Cent; Zinc, 4 Per Cent (B60-36) and for Steam or Valve Bronze Castings (B61-40).

2. *Leaded Red Brass and Leaded Semi-Red Brass Sand Castings.* This specification will replace immediately the Standard Specification B62-36 for Composition Brass or Ounce Metal Castings.

3. *Leaded Yellow Brass Sand Castings for General Purposes.*

4. *High Strength Yellow Brass and High Strength Leaded Yellow Brass Sand Castings.* This specification immediately replaces Standard Specification B54-39 for Manganese Bronze Sand Castings.

5. *Aluminum Bronze Sand Castings.* This specification replaces the Standard Specification B59-39 for Aluminum Bronze Sand Castings.

6. *Leaded Nickel Brass (Leaded Nickel Silver) and Leaded Nickel Bronze (Leaded Nickel Silver) Sand Castings.*

In addition, Tentative Specification B30-40T, covering Copper-Base Alloys in Ingot Form for Sand Castings, has been revised. Changes have been made in the requirements for Grades 9A and 9B Aluminum Bronze Ingot, as shown in the accompanying table.

Classification	Aluminum Bronze			
Numerical Designation	9A		9B	
	Min.	Max.	Min.	Max.
Copper, per cent	85.00	...	88.00	...
Tin, per cent	...	0.50	...	...
Nickel, per cent	...	5.00	...	...
Iron, per cent	2.50	4.50	...	1.25
Aluminum, per cent	7.00	12.00	8.00	11.00
Manganese, per cent	...	3.50	...	...
Other constituents, per cent	...	0.50	...	0.50

Aluminum

Committee B-7 on Light Metals and Alloys, Cast and Wrought, has made changes in eight specifications of interest to foundrymen. Tentative Specifications B26-37T for Aluminum Base Alloys Sand Castings has been changed by the addition of another alloy designated as Alloy *O*, containing 0.2 per cent copper max., 1.0 per cent iron max., 0.6 per cent silicon max., 0.5± 0.1 per cent magnesium, 5.0 per cent zinc, with a variation of +0.7 per cent and −0.2 per cent, 0.2±0.1 per cent titanium, 0.5± 0.1 per cent chromium, and 0.05 per cent each of total other impurities. Changes also have been made in the tensile requirements for Alloy *F* of this specification, and physical requirements are designated for Alloy *O*, which is said to have good physical properties in the as-cast condition. Aged, the alloy has 30,000 lb. per sq. in. tensile strength min., and 3 per cent elongation in 2-in., min. Specific gravities of the various alloys have been changed, and a note contains the typical yield strengths of the various alloys covered by this specification.

An additional grade has been added to Tentative Specifications B24-39T for Aluminum Ingots for Remelting. The new grade is designated as grade 99.2 and contains the following other elements in maximum percentages: 0.1 per cent copper, 0.4 per cent iron, 0.4 per cent silicon, 0.03 per cent magnesium, 0.03 per cent manganese, 0.03 per cent zinc, 0.03 per cent titanium, 0.03 per cent nickel, and a max. of total other impurities of 0.1 per cent.

An additional grade has been added to Tentative Specification B37-39T covering Aluminum for Use in Iron and Steel Manufacture. This new grade is designated as Grade 90.0 and contains a minimum of 90 per cent aluminum and the following maximums of other elements: Copper, 4 per cent; iron, 10 per cent; silicon, 10 per cent; magnesium, 5 per cent; manganese, 1.5 per cent; zinc, 2 per cent; nickel, 0.5 per cent; chromium, 0.2 per cent; tin plus lead, 0.5 per cent; and a maximum of other impurities of 0.5 per cent.

In Tentative Specification B58-37T for Aluminum Base Alloys in Ingot Form for Sand Castings, the magnesium content of Alloy *GG* has been changed from 0.3 per cent. max. to 0.1 per cent max.

In Tentative Specification B80-40T for Magnesium Base Alloys Sand Castings, the silicon content requirement of Alloys Nos. 2, 3, 4, 14 and 17 has been lowered from 0.5 per cent max. to 0.3 per cent max. In addition, chemical requirements for the

two high purity alloys designated as Nos. 4X and 17X have been added. The tensile requirements for Alloy Nos. 4 and 17 also have been revised, and the physical requirements obtained by various heat treatments, which apply to Alloy No. 4, now also apply to Alloy 4X. Likewise, the physical requirements in the various heat treated conditions applying to Alloy No. 17 now also apply to Alloy 17X.

In Tentative Specification B108-38T for Aluminum Base Alloy Permanent Mold Castings, Alloy 1 has been deleted, as have been its requirements in Tables 1 and 2. The same change has been made in Tentative Specifications B112-38T for Aluminum Base Alloys in Ingot Form for Permanent Mold Castings.

Magnesium

In Tentative Specification B93-40T for Magnesium Base Alloys in Ingot Form for Sand Castings and Die Castings, the chemical requirements for three high purity alloys, designated as Nos. 4X, 13X and 17X, have been added.

On the recommendation of Committee B-2, Subcommittee VIII on Miscellaneous Refined Metals and Alloys, Tentative Specifications B51-38T for Phosphor Tin, B52-38T for Phosphor Copper, and B53-38T for Silicon Copper, have been advanced to Standards.

Malleable Iron

In the report of Committee A-7, it was recommended that the words "yield point," wherever they occur in any specification under the jurisdiction of Committee A-7, be changed to "yield strength" to bring the nomenclature in line with accepted practice.

Cast Iron

Probably the outstanding piece of work of Committee A-3 was the adoption of Tentative Recommended Practice for Evaluating the Microstructure of Graphite in Cast Iron. This work was done in cooperation with the American Foundrymen's Association Gray Iron Division Committee on Classification of Graphite in Gray Iron under the chairmanship of W. E. Mahin, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Subcommittee VIII on Microstructure of Cast Iron of Committee A-3 under the chairmanship of G. F. Comstock, Titanium Alloy Mfg. Co., Niagara Falls, N. Y., was the cooperating A.S.T.M. committee. *It should be noted that this work is a recommended practice and not a standard.*

In addition, Tentative Specification A44-39T, covering Cast Iron Pit-Cast Pipe for Water and Other Liquids, has been recommended for advancement to Standard.

It has been recommended that Standard Specification A159-40T for Automotive Gray Iron Castings be revised to bring it more in line with S.A.E. specifications. The change recommended is that the total carbon content for Alloy No. 212 be increased from 3.45 ± 0.15 per cent to 3.55 ± 0.15 per cent, that the silicon requirement be changed from 2.90 ± 0.10 per cent to 2.75 ± 0.15 per cent, and that the alloys vanadium and titanium be added to those mentioned in the specification.

Steel

Of interest to steel foundrymen should be the recommendation by Subcommittee VIII on Steel Castings of Committee A-1 that, with minor revisions, Tentative Specifications A215-39T for Carbon Steel Castings Suitable for Fusion Welding for Miscellaneous Industrial Uses be advanced to Standard. This subcommittee also has organized a new section to cooperate with government agencies concerned with standards of steel castings so that the new specifications, which may be developed or revised standards, will be as satisfactory as possible from the standpoint of all interests concerned. E. W. Campion, The Bonney-Floyd Co., Columbus, Ohio, has been appointed chairman of the new section.

Coke

Gray iron foundrymen will be interested to know that Tentative Definition D121-26T, covering the term Coke, has been withdrawn, and that Subcommittee VIII on Foundry Coke of Committee D-5 on Coal and Coke, has recommended the withdrawal of Standard Specification D17-16 for Foundry Coke as it has outlived its usefulness. It further states that it does not seem feasible to prepare a general specifications covering Foundry Coke because of the fact that larger consumers prepare their own specifications based on the particular use for the coke and the smaller consumers purchase coke which has been found to be satisfactory by trial. The subcommittee also recommended that efforts to prepare foundry coke specifications be discontinued.

Pittsburgh Foundrymen Elect Scheckhaus President

CHARLES J. SCHECKHAUS, foundry superintendent, Union Spring & Mfg. Co., New Kensington, Pa., was elected recently as president of

the Pittsburgh Foundrymen's Association. Last year he served as chairman of the membership and attendance committee.

McGuire at Kentucky University

FRANCIS T. McGUIRE, former director, Michiana Chapter, has assumed duties as assistant professor of metallurgy, University of Kentucky, Lexington, Ky. Mr. McGuire was formerly a teaching fellow, department of metallurgy, University of Notre Dame.

Electric Furnace Melting—I

By A. G. Gierach, Chicago Heights, Ill.

A. G. Gierach, charge of melting, American Manganese Steel Division, American Brake Shoe & Foundry Co., Chicago Heights, Ill., presents, in this first section of his paper, some valuable information concerning electric furnace melting. The author gives his reasons for the advantage of the electric furnace, how the indirect arc furnace was developed, data on electrodes and useful facts in relation to furnace bottoms, such as preparation, burning-in and ramming. The second section of this paper will be published in the next edition of American Foundryman.

ANY engineering handbook that one picks up, contains page upon page of alloy steels, together with a list of physical properties. It seems strange that so many steels should be necessary to fulfill so many requirements, but we are told that each steel has its specific purpose. And the list is getting larger year by year, augmented by individual engineers and purchasing agents who understand metallurgy and who designate their own specifications. The introduction of electric melting may be the real beginning of an era of alloy steels for all industrial purposes.

Advantages of Electric Furnace.

Before the advent of the electric furnace, when it became necessary to make a complex alloy, the crucible process usually was used. Large tonnage production, if not actually impeded, was certainly not stimulated. All metals that were and can be made in a crucible, or by any other method, can be made in the electric furnace. For the complete refining of the highest grades of steel, the use of the electric furnace now has been established thoroughly. In quality, the metal equals or surpasses the best that was ever made in a crucible—at least, so the tool steel men inform us. In many cases, the cost is less than it would be by using other or older methods.

The advantage of the electric furnace is that a variety of difficult specification steels can be made with a greater degree of accuracy than hitherto had been deemed possible. In all cases, a greater and more precise recovery of the ferroalloys employed is obtained. As a corollary to this statement, it is possible to remelt alloy scrap with practically no losses. This becomes a great advantage when melting the higher alloy steels, commonly designated as the corrosion and heat resisting alloys.

Development of Direct-arc Furnace

In 1839, a certain Frenchman, Napier, was experimenting with an electric arc and found that when he introduced a piece of wire into the arc, the end of the wire would melt. The principle today is the same, although Messrs. Heroult and Payne are entitled to some credit for the development of the electric furnace. Automatic electrode controls, multiple voltage substations, and top charging are features that have brought this type of equipment to the front.

The Direct-arc Furnace

The arc furnace, of which the Moore, Heroult and Swindell are common types, consists of a steel shell lined with refractories, a refractory-lined roof and finally, a refractory bottom. The power is introduced by means of three electrodes suspended from supports or holders, and these electrodes enter into the furnace through openings or ports in the roof.

Electrodes

Electrodes may be of either amorphous carbon or graphite types. The electrical conductivity of the latter is approximately four times that of carbon. In recent years, furnaces have appeared which draw enormous current. In such installations, graphite has gained preference, because of the heavier electrode arms, holders, and subsequent larger wench motors that are required to carry the same current through amorphous carbon.

Electrode consumption is one of the major items of the conversion cost of electric steel. The figure between different installations is quite variable, and direct comparisons always cannot be made. Such variables as the number of slags used, whether acid or basic operation, insulation of the furnace shell, the

Fig. 1—A heat being tapped from an electric furnace.

K.V.A. rating of the transformer and the physical characteristics of the slag, all produce a variation in not only the electrode consumption, but also in the power consumption and the speed of the operation.

The operation of the furnace, as in the open hearth, may be either acid or basic, the choice of which dictates what kind of refractories are to be used for lining. For a basic furnace, the hearth is lined with magnesite brick, while for acid operation, silica brick is used. The roof in both cases is either silica brick or fire brick. It is a sound idea, and it pays good dividends, to put a layer of insulating brick in the bottom directly on the shell.

Fig. 2—Pouring molds.

Preparation of Bottoms

Furnace bottoms always consist of several layers of brick, upon which the working surface is then either rammed or burned in. In this connection, a good rammed bottom is always better than a poorly burned-in one. For the larger units, or for any furnace that is called upon to handle active metal, or where additions of ore are common practice, it is advisable to burn-in a good bottom. Because the bottom is one of the working surfaces of the heat, it becomes highly important that no time, expense, or ability should be spared on this important detail. An accepted requirement for a good bottom is that it "stays put." This means that the material used should be highly refractory. Good, uniform, clean metal cannot be made on a bottom that comes-up during melting. A great deal of patching between heats is bad, because it introduces a variable in working the heat. When major repairs are necessary, it is advisable to take time out and burn in a patch. Any bottom that becomes striated with metal, will give variable results in the ultimate metal. Alloy pick-up, one of the bugaboos of melters, may be attributed largely to bad furnace bottoms.

The use of acid or basic material for a furnace bottom is not always a matter of choice. Manganese steel is one metal which demands a basic operation. Most of the others can be made on either acid or basic bottoms, depending upon local conditions and requirements. In the casting division of electric melting, the acid process is favored by many because of the greater fluidity obtained and the higher voltages that may be used with consequent faster production. For closer chemical control, greater efficiency in recovering and preserving the alloys, and in cases where the raw materials dictate, it is advantageous to use the basic process.

Burning-in the Bottom

The important feature of burning-in a bottom is to bring the brickwork in the hearth to incipient fusion before adding the bottom material. To insure good drying-out at low cost, and to prevent the brick from spalling, it is most important that the furnace, before any excessive heat is applied, should first be slowly and carefully heated. A good procedure is to start on one of the lower taps and, with restricted power input, apply heat for half an hour, and then shut off the power altogether for 10 min. Repeat this four of five times, gradually decreasing the length of the shut-down period, and then discontinue it altogether. For a 3-ton furnace, about 8 to 10 hrs. are required to bring it up to a temperature when burning-in may begin.

Successive layers are then burned in place, one at a time, until the pre-determined thickness has been sintered into place. For the uninitiated, the electrical connection in the furnace, with which the three electrodes strike the arc, consists of two pieces of electrodes placed on the bottom brick work on brick supports and in the form of a "T." The bottom material, especially for a basic-lined furnace, usually contains an admixture of 5 to 15 per cent open-hearth slag to promote fusion. For acid bottoms, the common flux is lime. By using the minimum amount of flux, a better furnace bottom results, but naturally more difficulty is involved in burning it in.

Rammed Bottoms

Rammed bottoms are set into place much the same as the material in a rammed ladle. For a basic bottom, magnesite or magnesite and dolomite, together with hot tar, or magnesite to which about 8 per cent fine clay has been intimately mixed by mulling in a sand mill, are all in common use. For acid bottoms, sand or ganister with proportions of fire clay and molasses are used most widely. In either case, after the material has been rammed, it first must be dried carefully and then baked and

burned in with a "T" connection, bringing the furnace up to a temperature equivalent to the temperature that exists after tapping a heat.

Much has been said about contamination of heats from the furnace bottom. The author refers to the occasions when it becomes necessary to make a wide and abrupt change in analysis from heat to heat. When the usual product, made on a given bottom, contains 12 per cent magnanese, it is very difficult to make a steel calling for only 0.50 to 0.80 per cent of this element. Likewise, if the common product contains 35 per cent nickel and it is necessary to make a heat containing less than 0.50 per cent nickel, the specter again appears. Although it is said that a well burned-in bottom may be obtained by use of a rammed-in material, the fact remains, nevertheless, that steel, when hot and fluid, finds its way into the bottom material and is present in the form of striations and sometimes even in chunks. In a succeeding heat, especially if it has a higher melting point, part of this bottom material may come up and diffuse with the metal, upsetting the required analysis, causing endless worry and sometimes catastrophe.

Wash Heats

So-called "wash" heats are prescribed to eliminate this evil. Such heats usually consist of a melt-down of common scrap, getting the metal good and hot and relying upon it to pick up any material in the bottom which is to be disposed of. Alternatively, a cold melt-down is also effective. By this is meant that the charge is melted down in such a manner that the pool of metal which collects on the bottom will not become too hot and, consequently, overheat the bottom. This may be accomplished by raising the electrodes several times during the melt-down, and pushing in a little scrap. Of course, the usual procedure of placing heavy pieces in the bottom, when they are available in the charge, becomes doubly important.

(To Be Continued)

Chesapeake Aids in Defense Training Course

By F. Bruggman,* Baltimore, Md.

THE Division of Vocational Education, Department of Education, Baltimore, Md., in co-operation with the apprentice training committee, Chesapeake Chapter, A.F.A., recently completed their national defense training course for men in foundry occupations. The meetings were started in May and finished in June. All meetings were held on Monday and Wednesday nights from 7:30 to 9:30 p.m. at the Baltimore Polytechnic Institute.

There were two courses; the related foundry course and the foundry shop course. The purpose of the former was to give apprentices and beginning workers employed in the foundry occupations, technical information directly related to their job in the foundry. This course included the study of various types of molds, molding equipment, green sand molding, principles of green sand molding, dry sand molding, principles of dry sand molding, core making, open sand molding, molding machines, loam molding and foundry layout.

The foundry shop course was intended for those who are not working at the foundry trade, but who are perhaps employed in other occupations and are interested in getting into the foundry trade. Those enrolled in this course studied foundry equipment, core making, core ovens, bench molding, floor molds, molding machines, safety, inspection, foundry management, timekeeping, records of supplies, operating furnaces, linings for furnaces, repairing furnaces, care of ladles, pattern design and visits to foundries and shops.

During the course the following three lectures were given to the students: "Conditioning and Grading of Sands and Their Uses in the Foundry," by C. W. Thompson, New Jersey Silica Sand Co., Millville, N. J.; "Non-Ferrous Foundry and Molding Practice," by E. W. Horlebein, The Gibson & Kirk Co., Balti-

*Sales engineer, The Gibson & Kirk Co.

(Concluded on Page 24)

Part of the apprentice training class of the Chesapeake Chapter which was enrolled in the national defense course. The students are as follows: First row (left to right): Ray Tiece, Bethlehem Steel Co.; Franklin Reigle, Standard Gas Equipment Co.; William Reigle, Standard Gas Equipment Co.; Lewis Gross, American Radiator & Standard Sanitary Corp., and Edward Lynch, Kennedy Foundry Co. Second row (left to right): Arnold Bauernfeind, Standard Gas Equipment Co.; John Hesmar, American Hammered Piston Ring Co.; William Wilhelm, American Hammered Piston Ring Co.; Jerry Paxton, The Gibson & Kirk Co.; Charles Phillips, The Gibson & Kirk Co., and Carl Trentler, American Brake Shoe & Foundry Co. Third row (left to right): G. O. Webster, instructor, Baltimore Polytechnic Institute; Peter Malinski, U. S. Coast Guard Yard; William Hook, Kennedy Foundry Co.; Orville Schwell, American Hammered Piston Ring Co.; James Dunivin, American Hammered Piston Ring Co., and T. C. Worley, instructor, Bethlehem Steel Co.
(Photo courtesy F. Bruggman, The Gibson & Kirk Co.)

Chapter Directory

Chicago Chapter

Meetings—2nd Monday, Monthly.
Place—Chicago Towers Club, Chicago.
Chairman—L. L. Henkel, Interlake Iron Co.
Vice-Chairman—A. G. Gierach, American Manganese Steel Div., Chicago Hts.
Secretary—B. L. Simpson, National Engineering Co.
Treasurer—C. C. Kawin, Chas. C. Kawin Co.
Directors—J. H. Abbott, Hickman, Williams & Co.
J. D. Burlie, Western Electric Co.
H. A. Forsberg, Continental Roll & Steel Foundry Co., East Chicago, Ind.
D. N. Gellert, Nichol-Straight Foundry Co.
A. S. Klopf, Hansell-Elcock Co.
J. F. Lammering, Hammond Brass Co., Hammond, Ind.
M. J. Lefler, Western Foundry Co.
L. F. Lottier, Peoples Gas, Light & Coke Co.
T. J. Magnuson, J. S. McCormick Co.
G. P. Phillips, International Harvester Co.
John W. Porter, American Steel Foundries.
L. H. Rudesill, Griffin Wheel Co.

Northeastern Ohio Chapter

Meetings—2nd Thursday, Monthly.
Place—Cleveland Club, Cleveland, Ohio.
President—Frank J. Dost, Sterling Foundry Co., Wellington.
Vice-President—J. H. Tressler, Hickman Williams & Co., Cleveland.
Secretary—Jack M. Lathrop, "The Foundry," Cleveland.
Treasurer—R. F. Lincoln, Osborn Mfg. Co., Cleveland.
Directors—S. N. Farmer, Sand Products Corp., Cleveland.
Wm. J. Feth, Forest City Foundries Co.
F. Ray Fleig, Smith Facing & Supply Co., Cleveland.
Wm. E. Goebert, Bowler Foundry Co.
J. G. Goldie, Cleveland Trade School.
E. J. Hedlund, Urick Foundry Co., Erie, Pa.
E. F. Hess, Ohio Injector Co., Wadsworth.
J. W. Horan, Sandusky Foundry & Machine Co., Sandusky.
W. O. Larson, W. O. Larson Foundry Co., Grafton.
J. C. Maher, Ohio Foundry Co.
William Manwell, Fulton Foundry & Machine Co., Cleveland.
L. P. Robinson, Werner G. Smith Co.
F. A. Stewart, National Malleable & Steel Castings Co.
M. G. Thomas, City Foundry Co., Cleveland.
A. J. Tuscany, Foundry Equipment Manufacturers' Assn., Cleveland.

Quad City Chapter

Meetings—3rd Monday, Monthly.
Place—Rotate between Hotel Blackhawk, Davenport, Iowa; Fort Armstrong Hotel, Rock Island, Ill.; and LeClaire Hotel, Moline, Ill.
Chairman—A. H. Putnam, A. H. Putnam Co., Rock Island.
Vice-Chairman—Alex Matheson, French & Hecht, Inc., Davenport, Iowa.
Secretary-Treasurer—J. Morgan Johnson, Tri-City Manufacturers' Assn., Moline.
Directors—P. T. Bancroft, Moline.
A. E. Hageboeck, Frank Foundries Corp., Moline.
W. E. Jones, Bettendorf Co., Bettendorf, Iowa.
Harry Mead, John Deere Harvester Works, East Moline.
J. H. Ploehn, French & Hecht, Inc., Davenport.
L. E. Roby, Peoria Malleable Castings Co., Peoria.
Ray Wendland, International Harvester Co., Rock Island.
R. E. Wilke, Deere & Co., Moline.
E. C. Wussow, Williams-White & Co., Moline.

Detroit Chapter

Meetings—3rd Thursday, Monthly.
Place—Detroit Leland Hotel, Detroit, Mich.
Chairman—V. A. Crosby, Climax Molybdenum Co.
Vice-Chairman—F. A. Melmoth, Detroit Steel Casting Co.
Secretary—A. H. Allen, Penton Publishing Co.
Treasurer—W. W. Bowring, Frederic B. Stevens, Inc.
Directors—O. L. Allen, Pontiac Motor Div., General Motors Corp., Pontiac.
Glenn Coley, Detroit Edison Co.
J. H. Crawley, American Foundry & Pattern Co.
H. W. Dietert, Harry W. Dietert Co.
A. J. Gonter, Dodge Div., Chrysler Corp.
O. E. Goudy, Kelsey-Hayes Wheel Co.
E. C. Hoenicke, Eaton-Erb Foundry Div., Eaton Mfg. Co.
Carl F. Joseph, Saginaw Malleable Iron Div., General Motors Corp., Saginaw.
R. G. McElwee, Vanadium Corp. of America
W. B. McFerrin, Cadillac Motor Car Div., General Motors Corp.
E. L. Morrison, Budd Wheel Co.
O. E. Sundstedt, General Foundry & Mfg. Co., Flint.

St. Louis District Chapter

Meetings—2nd Thursday, Monthly.
Place—DeSoto Hotel, St. Louis, Mo.
Chairman—Carl Morken, Carondelet Foundry Co.
Vice-Chairman—C. B. Shanley, Semi-Steel Castings Co.
Secretary-Treasurer—J. W. Kelin, Federated Metals Div., A. S. & R. Co.
Directors—L. J. Desparois, Pickands Mather & Co.
L. C. Farquhar, American Steel Foundries, Granite City, Ill.
L. J. Filstead, John C. Kupferle Foundry Co.
Emil Goerger, City Pattern & Model Co.
H. Goodwin, Medart Co.
Walter Illig, Banner Iron Works.
Webb Kammerer, Midvale Mining & Mfg. Co.
Wm. McKey, Key Co.
George Mitsch, American Car & Foundry Co.
A. O. Nilles, Griffin Wheel Co., N. Kansas City, Kans.
Francis O'Hare, Central Brass & Aluminum Foundry.
James Roland, Fry-Fulton Lumber Co.
Walter Zeis, Midwest Foundry Supply Co.

Philadelphia Chapter

Meetings—2nd Friday, Monthly.
Place—Engineers' Club, Philadelphia.
Chairman—Harry Reitinger, U. S. Pipe & Foundry Co., Burlington, N. J.
Vice-Chairman—D. J. Peake, Florence Pipe & Foundry Co., Florence, N. J.
Secretary-Treasurer—W. B. Coleman, W. B. Coleman & Co.
Directors—J. T. Fegley, North Bros. Mfg. Co.
R. J. Keeley, Ajax Metal Co.
Robert Latham, Bethlehem Steel Co.
R. S. Munson, Atlantic Steel Castings Co.
John M. Robb, Jr., Hickman Williams & Co.
John H. S. Spencer, H. W. Butterworth & Sons.
M. R. Taggart, Taggart & Co.

Wisconsin Chapter

Meetings—3rd Friday, Monthly.
Place—Schroeder Hotel, Milwaukee.
President—A. C. Ziebell, Universal Foundry Co., Oshkosh.
Vice-President—H. C. Waldron, Nordberg Mfg. Co., Milwaukee.
Secretary—George K. Dreher, Ampco Metal, Inc., Milwaukee.
Treasurer—R. F. Jordan, Sterling Wheelbarrow Co., Milwaukee.
Directors—John Bing, A. P. Green Fire Brick Co., Milwaukee.
B. D. Claffey, General Malleable Corp., Waukesha.
W. A. Hambley, Allis-Chalmers Mfg. Co., West Allis.
Harry Ladwig, Allis-Chalmers Mfg. Co., West Allis.
Fred Pritzlaff, Falk Corp., Milwaukee.
T. E. Ward, Badger Malleable & Mfg. Co., South Milwaukee.
David Zuege, Sivyer Steel Casting Co., Milwaukee.

Northern California Chapter

Meetings—2nd Friday, Monthly.
Place—Rotate between San Francisco and Oakland, Calif.
Chairman—E. M. Welch, American Manganese Steel Div., San Francisco.
Vice-Chairman—F. A. Mainzer, Pacific Brass Foundry of San Francisco, Inc.
Secretary-Treasurer—G. L. Kennard, Northern California Foundrymen's Institute, San Francisco.
Directors—Howard Detro, American Radiator & Standard Sanitary Mfg. Co., Richmond.
John S. Fowler, Pacific Foundry Co., San Francisco.
J. L. Francis, Vulcan Foundry Co., Oakland
I. L. Johnson, Pacific Steel Casting Co., Berkeley.
B. C. Page, F. K. Simonds Co., Berkeley.
S. D. Russell, Phoenix Iron Works, Oakland.
P. C. Valentine, Del Monte Properties Co., San Francisco.
Richard Vosbrink, Berkeley Pattern Works, Berkeley.

Birmingham District Chapter

Meetings—3rd Friday, Monthly.
Place—Tutwiler Hotel, Birmingham, Ala.
Chairman—J. A. Bowers, American Cast Iron Pipe Co.
Vice-Chairman—J. R. Reynolds, U. S. Pipe & Foundry Co., Bessemer.
Secretary-Treasurer—H. G. Mouat, Whiting Corp.
Directors—W. Carson Adams, Adams, Rowe & Norman.
A. S. Holberg, Alabama Clay Products Co.
G. E. Jones, U. S. Pipe & Foundry Co., Bessemer.
W. O. McMahon, Sloss-Sheffield Steel & Iron Co.
Wayne Nelson, Young & Vann Supply Co.
H. A. Newbury, Newbury Mfg. Co., Talladega.
H. J. Noble, American Cast Iron Pipe Co.
R. L. Ogden, Stockham Pipe Fittings Co.
C. B. Saunders, Tennessee Coal Iron & R. R. Co.
J. A. Woody, American Cast Iron Pipe Co.

Western New York Chapter

Meetings—1st Friday, Monthly.
Place—Hotel Touraine, Buffalo, N. Y.
Chairman—R. K. Glass, Republic Steel Corp.
Vice-Chairman—R. T. Rycroft, Jewell Alloy & Malleable Co.
Secretary—Eliot Armstrong, Inter-Allied Foundries of New York State.
Treasurer—V. L. Whitehead, Jr., Whitehead Bros. Co.
Directors—F. S. Comerford, Symington-Gould Corp., Rochester.
Jos. M. Kaufman, Harrison Div., General Motors Corp., Lockport.
R. D. Loesch, Lake Erie Foundry Co.
J. C. McCallum, McCallum-Hatch Bronze Co.
J. J. Mayer, Lumen Bearing Co.
Alex Rankin, Lake Erie Engineering Corp.

J. R. Turner, Queen City Sand & Supply Co.
J. L. Yates, Worthington Pump & Machinery Corp.

Southern California Chapter

Meetings—4th Thursday, Monthly.
Place—Elks Club, Los Angeles.
President—B. G. Emmett, Los Angeles Steel Casting Co., Los Angeles.
Vice-President—Earl Anderson, Enterprise Foundry Corp., Los Angeles.
Secretary—W. D. Bailey, Jr., Pacific Metals Co., Ltd., Los Angeles.
Treasurer—Gordon F. Sondraker, Chamberlain Co., Los Angeles.
Directors—A. M. Barker, Barker Foundry Supply Co., Los Angeles.
B. M. Campbell, Dayton Foundry, Inc., Hollydale.
J. E. Eppley, Kinney Iron Works, Los Angeles.
E. M. Hagener, General Metals Corp., Los Angeles.
W. F. Haggman, Foundry Specialties Co., Huntington Park.
D. A. Luper, Grayson Heat Control Co., Ltd., Lynwood.
H. E. McGowan, H. E. McGowan Co., Los Angeles.
James O'Hara, Fraters Valve & Fittings Co., Los Angeles.
Earl Shoemaker, Kay-Brunner Steel Products, Inc., Alhambra.

Metropolitan Chapter

Meetings—1st Wednesday, Monthly.
Place—Essex House, Newark, N. J.
Chairman—N. E. Woldman, Eclipse Aviation Div., Bendix Aviation Corp., Bendix, N. J.
Vice-Chairman—F. G. Sefing, International Nickel Co., New York City.
Secretary—K. A. DeLonge, International Nickel Co., New York City.
Treasurer—T. D. Parker, Climax Molybdenum Co., New York City.
Directors—D. E. Broggi, Neptune Meter Co., Long Island City, N. Y.
H. A. Deane, American Brake Shoe & Foundry Co., Mahwah, N. J.
H. G. Lamker, Wright Aeronautical Corp., Paterson, N. J.
A. C. Leverton, Fisher Fdry. Div., Bound Brook Oil-less Bearing Co., Bound Brook, N. J.
W. Martin, Speery Gyroscope Co., Inc., Brooklyn, N. Y.
W. O. Moyer, Otis Elevator Co., Yonkers, N. Y.
R. E. Nesbitt, Pratt Institute, Brooklyn, N. Y.
D. Polderman, Jr., Whiting Corp., New York City.
Sam Tour, Lucius Pitkin, Inc., New York City.
K. V. Wheeler, American Steel Castings Co., Newark, N. J.

Northern Illinois-Southern Wisconsin Chapter

Meetings—2nd Tuesday, Monthly.
Place—Rotate between Rockford and Freeport, Ill., and Beloit, Wis.
Chairman—G. K. Minert, Gunite Foundries Corp., Rockford.
Vice-Chairman—H. L. Klopf, Fairbanks Morse & Co., Beloit, Wis.
Secretary-Treasurer—R. W. Mattison, Mattison Machine Works, Rockford.
Technical Secretary—John Cochran, Sundstrand Machine Tool Co., Rockford.
Directors—J. T. Clausson, Greenlee Bros. Co., Rockford.
Eli Johnson, Greenlee Bros. Co., Rockford.
G. J. Landstrom, Sundstrand Machine Tool Co., Rockford.
C. V. Nass, Fairbanks Morse & Co., Beloit, Wis.
C. S. Nielson, Geo. D. Roper Corp., Rockford.
P. A. Paulson, Gunite Foundries Corp., Rockford.
Max Reuteler, Fairbanks Morse & Co., Beloit, Wis.
F. N. Rundquist, Beloit Castings Co., Beloit, Wis.
H. J. Wade, Beloit, Wis.

Ontario Chapter

Meetings—Last Friday, Monthly.
Place—Royal York Hotel, Toronto, and Royal Connaught Hotel, Hamilton.
Chairman—N. B. Clarke, Steel Co. of Canada, Ltd., Hamilton.
Vice-Chairman—J. J. McFadyen, Galt Malleable Iron Co., Ltd., Galt.
Secretary-Treasurer—G. L. White, Westman Publications, Ltd., Toronto.
Directors—T. D. Barnes, Wm. R. Barnes Co., Ltd., Hamilton.
T. Clough, Dominion Wheel & Foundries, Ltd., Toronto.
J. Cunningham, International Malleable Iron Co., Ltd., Guelph.
C. C. MacDonald, Frederic B. Stevens, Inc., Ltd., Toronto.
N. C. MacPhee, McKinnon Industries, Ltd., St. Catharine.
John Reid, Canadian Westinghouse Co., Ltd., Hamilton.
Robert Robertson, International Harvester Co. of Canada, Ltd., Hamilton.
J. C. Stavert, Babcock-Wilcox & Goldie-McCulloch, Ltd., Galt.
John Thwaites, Beatty Bros., Ltd., London.

Michiana Chapter

Meetings—1st Tuesday, Monthly.
Place—Hotel La Salle, South Bend, Ind.
Chairman—E. C. Bumke, Oliver Farm Equipment Co., South Bend.
Vice-Chairman—H. Klouman, Michiana Products Corp., Michigan City.
Secretary-Treasurer—L. L. Andrus, American Foundry Equipment Co., Mishawaka.
Directors—J. E. Drain, Oliver Farm Equipment Co., South Bend.
S. W. Howard, Weil-McLain Co., Michigan City.
R. J. McSherry, Studebaker Corp., South Bend.
R. E. Patterson, Elkhart Foundry & Machine Co., Elkhart.
O. A. Pfaff, American Foundry Equipment Co., Mishawaka.
George E. Stoll, Bendix Products Corp., South Bend.
B. J. Voll, Sibley Machine & Foundry Co., South Bend.

Central New York Chapter

Meetings—2nd Friday, Monthly.
Place—Hotel Onondaga, Syracuse, N. Y.
Chairman—L. D. Wright, U. S. Radiator Corp., Geneva.
Vice-Chairman—N. H. Boardman, Elmira Foundry Co., Elmira.
Secretary—L. E. Hall, Syracuse Chilled Plow Co., Syracuse.
Treasurer—E. G. White, Crouse-Hinds Co., Syracuse.
Directors—E. J. Bair, Sr., Utica Radiator Corp., Utica.
J. W. Barker, Andes Range & Furnace Corp., Geneva.
Prof. A. C. Davis, Cornell University, Ithaca.
L. P. Fedigan, Batavia.
C. M. Fletcher, Fairbanks Co., Binghamton.
M. G. Hollenbeck, Kennedy Valve Mfg. Co., Elmira.
H. H. Judson, Goulds Pumps, Inc., Seneca Falls.
F. F. Shortsleeve, Elmira.
F. C. Wheeler, Kimman & Wheeler, Syracuse.

Cincinnati District Chapter

Meetings—2nd Tuesday, Monthly.
Place—Hotel Alms, Cincinnati, Ohio.
Chairman—W. M. Ball, Jr., Edna Brass Mfg. Co.
Vice-Chairman—Frank E. Hutchinson, Reliance Foundry Co.
Secretary—H. M. Wood, W. W. Sly Mfg. Co.
Treasurer—L. A. Gosiger, S. Obermayer Co.
Directors—H. K. Ewig, Cincinnati Milling Machine Co.
Charles Hilb, H. Kramer & Co.
H. W. Kautz, Cincinnati Milling Machine Co.
E. H. King, Hill & Griffith Co.
E. F. Loges, Kramer Bros. Foundry Co.
H. F. McFarlin, Lunkenheimer Co.
M. F. Milligan, Lunkenheimer Co.
J. W. Nichols, Ingersoll Rand Co.

Central Indiana Chapter

Meetings—1st Monday, Monthly.
Place—Hotel Washington, Indianapolis, Ind.
Chairman—H. B. Harvey, Indiana Foundry Corp., Muncie.
Vice-Chairman—B. P. Mulcahy, Citizens' Gas & Coke Utility, Indianapolis.
Secretary—R. A. Thompson, Electric Steel Castings Co., Indianapolis.
Treasurer—J. P. Lentz, International Harvester Co., Indianapolis.
Directors—N. E. Baker, C & G Foundry & Pattern Works, Indianapolis.
W. B. Ballantine, Haynes Stellite Co., Kokomo.
R. H. Bancroft, Perfect Circle Co., New Castle.
Charles Beckett, Beckett Bronze Co., Muncie.
L. E. Davis, Republic Coal & Coke Co., Terre Haute.
C. M. Hardy, Hougland & Hardy, Inc., Evansville.
Robert Langsenkamp, Langsenkamp-Wheeler Brass Works, Indianapolis.
E. G. Schmidt, Jr., International Harvester Co., Indianapolis.
W. L. Seymour, Hoosier Iron Works, Kokomo.
L. Snyder, Hickman, Williams & Co., Cincinnati, O.
I. R. Wagner, Electric Steel Castings Co., Indianapolis.
S. C. Wasson, National Malleable & Steel Castings Co., Indianapolis.

Chesapeake Chapter

Meetings—4th Friday, Monthly.
Place—Engineers Club, Baltimore.
Chairman—E. W. Horlebein, Gibson & Kirk Co.
Vice-Chairman—J. E. Crown, U. S. Navy Yard, Washington, D. C.
Secretary-Treasurer—L. H. Denton, Baltimore Association of Commerce.
Directors—C. C. Adams, Bethlehem Steel Co., Sparrows Pt., Md.
S. W. Brinson, U. S. Navy Yard, Portsmouth, Va.
Wm. C. Franz, Flynn & Emrich Co.
C. L. Frear, U. S. Navy Dept., Bureau of Ships, Washington, D. C.
H. A. Horner, Frick Co., Waynesboro, Pa.
Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va.
H. S. Malsberger, American Chain & Cable Co., York, Pa.
J. C. Pendleton, Newport News Shipbuilding & Dry Dock Co., Newport News, Va.
V. F. Stine, Pangborn Corp., Hagerstown, Md.

Western Michigan Chapter

Place—Hotel Occidental, Muskegon, Mich.
Chairman—D. F. Seyferth, West Michigan Steel Foundry Co., Muskegon.
Vice-Chairman—C. J. Lonnee, Muskegon Piston Ring Co., Sparta.
Secretary-Treasurer—Max Amos, Standard Automotive Parts Co., Muskegon.
Directors—E. W. Beach, Campbell Wyant & Cannon Foundry Co., Muskegon.
F. J. Buckley, Kalamazoo Foundry & Machine Co., Kalamazoo.
G. W. Cannon, Jr., National Motor Casting Div., Campbell Wyant & Cannon Foundry Co., South Haven.
E. G. Carter, Standard Automotive Parts Co., Muskegon.
C. M. Clover, Clover Foundry Co., Muskegon.
A. E. Jacobson, Grand Haven Brass Foundry, Grand Haven.
J. C. Jensen, Battle Creek Foundry Co., Battle Creek.
O. G. Jentsch, Wolverine Brass Works, Grand Rapids.
J. W. Livingston, Blackmer Pump Co., Inc., Grand Rapids.
R. J. Teetor, Cadillac Malleable Iron Co., Cadillac.
C. P. Ziegler, Grand Rapids Foundry, Grand Rapids.

Twin City Chapter

Chairman—E. C. Madson, Anderson Foundry Co., Bayport, Minn.
Vice-Chairman—R. M. Akers, Western Alloyed Steel Castings Co., Minneapolis.
Secretary-Treasurer—O. W. Potter, University of Minnesota, Minneapolis.
Directors—Jack Bryant, Northern Pump Co., St. Paul.
Stuart Cameron, Valley Iron Works, St. Paul.
Fred Christensen, R. R. Howell & Co., Minneapolis.
Fred Kaim, Union Brass & Metal Mfg. Co., St. Paul.
E. H. Ryan, St. Paul Brass Foundry Co., St. Paul.
S. V. Wood, Minneapolis Electric Steel Castings Co., Minneapolis.

NEW MEMBERS

(June 19 to July 22, 1941)

Conversions

Sustaining from Company

Aluminum Industries, Inc., Cincinnati, Ohio (H. J. Hater, Treas.).

Climax Molybdenum Co., New York, N. Y. (J. B. Thorpe, Vice-President).

Crane Company, Chicago, Ill. (V. P. Rumely, Works Mgr.).

Detroit Steel Casting Co., Detroit, Mich. (F. A. Melmoth, V. P. Chg. of Operations).

Eclipse Aviation Div., Bendix Aviation Corp., Bendix, N. J. (A. Cristello, Fdry. Mgr.).

Florence Pipe Foundry & Machine Co., Florence, N. J. (Douglas J. Peake, Supt.).

Peerless Mineral Products Co., Conneaut, Ohio (F. L. Moore, Pres. & Treas.).

Perfect Circle Co., New Castle, Ind. (S. A. Norrick, Plant Mgr.).

Royer Foundry & Machine Co., Wilkes-Barre, Pa. (S. B. Davies, President).

U. S. Pipe & Foundry Co., Burlington, N. J. (D. P. Hopkins, Vice.-Pres.).

Vermont Foundries, Inc., Springfield, Vt. (Merton White, Ass't Treas.)

Youngstown Foundry & Machine Co., Youngstown, Ohio (B. G. Parker, President).

Company from Personal

U. S. Hoffman Machinery Corp., Air Appliance Div., New York, N. Y. (L. B. Hardtla, Mgr.).

Central Indiana Chapter

Justin Blay, Ass't Fdy. Met., International Harvester Co., Indianapolis, Ind.

Central New York Chapter

John H. Schmidt, Engr., U. S. Hoffman Machinery Corp., Syracuse, N. Y.

Chesapeake Chapter

Wilmer H. Lawrence, Fdry. Supt., Lynchburg Foundry Co., Radford, Va.

Benjamin L. Spitzer, Appr. Molder, Norfolk Navy Yard, Portsmouth, Va.

Chicago Chapter

Dan Farrell, Supt. of Fdry., Carnegie-Illinois Steel Corp., Chicago, Ill.

V. E. Winfield, Sales, U. S. Hoffman Machinery Corp., New York, N. Y.

Cincinnati Chapter

George T. Oberklein, Sales, U. S. Hoffman Machinery Corp., New York, N. Y.

*Wright Aeronautical Corp., Lockland, Ohio (Donald Whitehead, Fdry. Supt.).

John G. Sheller, Patt. Shop Foreman, American Rolling Mill Co., Middletown, Ohio.

Abe L. Young, Fdry. Supt., American Rolling Mill Co., Middletown, Ohio.

Detroit Chapter

Marshall V. Chamberlin, Met., Dow Chemical Co., Midland, Mich.

Clement V. Hungerman, Gen'l. Foreman, Core Room, Cadillac Motor Car Div., General Motors Corp., Detroit, Mich.

Metropolitan Chapter

Chauncey A. Crawford, Dev. & Res. Div., International Nickel Co., Inc., New York, N. Y.

*Farrand Foundry Corp., Bloomfield, N. J. (Richard M. Strayer, Fdry. Foreman).

John Irwin, Planning Engr., Wright Aeronautical Corp., Magnesium Fdry., Fairlawn, N. J.

Northeastern Ohio Chapter

Steve Csizmadia, Foreman, National Malleable & Steel Castings Co., Cleveland, Ohio.

John H. Weeter, Gen'l. Foreman, National Malleable & Steel Castings Co., Sharon, Pa.

Northern California Chapter

Walter M. Nussbaumer, Sales, Simonds Saw & Steel Co., San Francisco, Calif.

Northern Illinois and Southern Wisconsin Chapter

Edw. F. Goessel, Gen'l. Foreman, Beloit Iron Works, Beloit, Wis.

Ontario Chapter

Robert Robertson, Mall. Fdry. Supt., International Harvester Co., Ltd., Hamilton, Ont.

Philadelphia Chapter

Irwin L. Bossler, Patt. Foreman, American Chain & Cable Co., Inc., Reading, Pa.

Twin City Chapter

*Union Brass & Metal Mfg. Co., St. Paul, Minn. (Henry J. Kaim, Vice-President).

Wisconsin Chapter

Anthony J. Kuzniewski, Fdry. Foreman, Maynard Electric Steel Co., Milwaukee, Wis.

Ray A. Nauer, Chicago, Ill., Sales Engr., U. S. Graphite Co., Chicago, Ill.

Stephen Pohl, Metallurgist, Federal Malleable Co., West Allis, Wis.

Outside of Chapter

Warren W. Carson, Mgr., Sales Repr., Carson Sand Co., Howard, Centre Co., Pa.

Frederick R. Evans, Fdry. Instructor, Massachusetts Institute of Technology, Cambridge, Mass.

Walter Roth, Livraria Editora Suissa, Rio de Janeiro, Brazil.

*Company.

NEW CHAPTER OFFICERS

L. D. Wright
United States Radiator Corp.,
Geneva, N. Y.
Chairman,
Central New York Chapter

R. K. Glass
Republic Steel Corp.,
Buffalo, N. Y.
Chairman,
Western New York Chapter

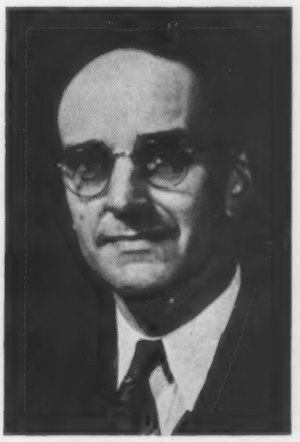
E. W. Horlebein
The Gibson & Kirk Co.,
Baltimore, Md.
Chairman,
Chesapeake Chapter

W. M. Ball, Jr.
The Edna Brass Mfg. Co.,
Cincinnati, Ohio
Chairman,
Cincinnati District Chapter

D. F. Seyferth
West Michigan Steel Foundry Co.,
Muskegon, Mich.,
Chairman,
Western Michigan Chapter

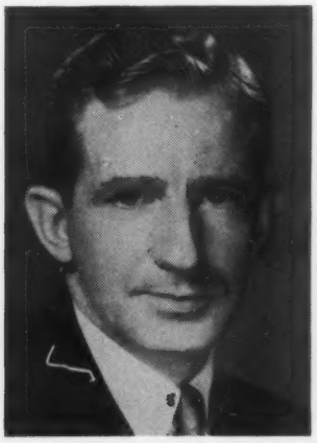
F. A. Melmoth
Detroit Steel Casting Co.,
Detroit, Mich.
Vice-Chairman,
Detroit Chapter

F. J. Sefing
International Nickel Co.,
New York, N. Y.
Vice-Chairman,
Metropolitan Chapter



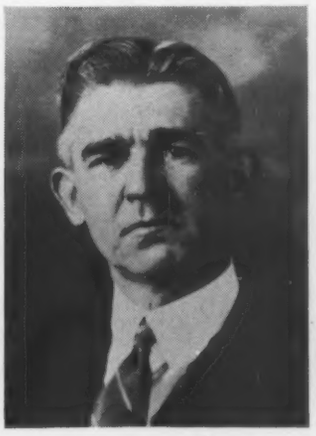
N. H. Boardman
Elmira Foundry Co.,
Elmira, N. Y.
Vice-Chairman
Central New York Chapter

Earl Anderson
Enterprise Foundry Corp.,
Los Angeles, Calif.
Vice-Chairman,
Southern California Chapter

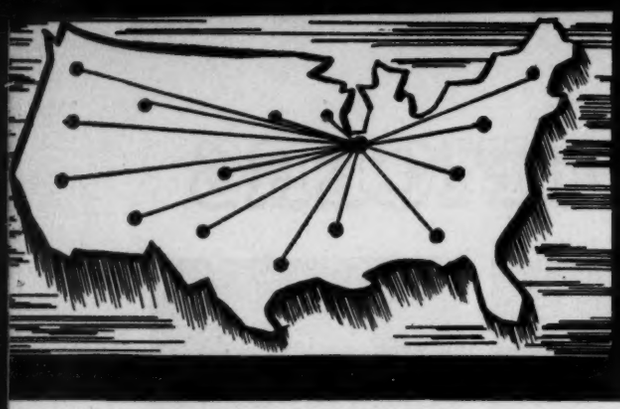


B. P. Mulcahy
Citizens' Gas & Coke Utility,
Indianapolis, Ind.
Vice-Chairman,
Central Indiana Chapter

H. C. Waldron
Nordberg Mfg. Co.,
Milwaukee, Wis.
Vice-Chairman,
Wisconsin Chapter



J. E. Crown
U. S. Navy Yard
Washington, D. C.
Vice-Chairman,
Chesapeake Chapter



Chapter Activities

Northern California Holds Annual Ladies' Night

By Geo. L. Kennard,* San Francisco, Calif.

GATHERED at Lake Merritt Hotel, Oakland, June 20, were over one hundred couples to enjoy the chapter's annal Ladies' Night party. Nothing was too good for the ladies as they thoroughly enjoyed the evening's festivities, which included dinner, a floor show and dancing.

A short business session during the evening saw the following elected as officers and directors of the chapter: *Chairman,* Edward M. Welch, American Manganese Steel Div., American Brake Shoe & Foundry Co., Oakland; *Vice-chairman,* Fred A. Mainzer, Pacific Brass Foundry of San Francisco, Inc.; *Secretary-Treasurer,* Geo. L. Kennard,

*Northern California Foundrymen's Institute, and secretary-treasurer, Northern California Chapter.

Cincinnati Chapter outing pictures show that a good time was had by all.

Northern California Foundrymen's Institute. Directors elected for two years were: H. I. Detro, American Radiator & Standard Sanitary Corp., Richmond; Ivan L. Johnson, Pacific Steel Casting Co., Berkeley; S. D. Russell, Phoenix Iron Works, Oakland, and Richard Vosbrink, Berkeley Pattern Works, Berkeley.

Following the election, Chairman Johnson thanked the chapter for the support they had given him during the year and then introduced the officers and directors elected. To S. D. Russell, past chairman, fell the honors of presenting to Mrs. Johnson a handsome gift from the chapter as a token of their appreciation for Chairman Johnson's good work and services during the past year.

Election at Western New York Picnic

By Eliot Armstrong,* Buffalo, N. Y.

THE scene at Kundara's Farm at 1 p.m., June 7, would have been enough to scare any hen out of her pin feathers if she could have been around to watch 250 foundrymen sit down and devour quantities of her nearest relatives. After carefully extracting all the white and dark meat from the pile of bones that once resembled a hen, or a reasonable facsimile, the men settled down for the last serious moment of the chapter year—the election of officers. After the customary procedure, the following were elected to serve the chapter for the ensuing year:

Chairman, R. K. Glass, Republic Steel Corp.

Vice-chairman, R. T. Rycroft, Jewell Alloy & Malleable Co.

Treasurer, V. L. Whitehead, Jr., Whitehead Bros. Co.

Secretary, Eliot Armstrong, Inter-Allied Foundries of New York State.

The following men were elected to serve as directors (term expires 1942): J. J. Mayer, Lumen Bearing Co.; J. C. McCallum, McCallum-Hatch Bronze Co.; Alex Rankin, Lake Erie Engineering Corp; (term expires 1943) R. D. Loesch, Lake Erie Foundry Co.; J. Kaufman, Harrison Div., General Motors Co., Lockport; (term expires 1944) F. J. Comerford, Symington-Gould Corp., Rochester; J. R. Turner, Queen City Sand & Supply Co., and J. L. Yates, Worthington Pump & Machinery Corp.

Following the election, the men were given the run of the land and really took advantage of the opportunity.

*Inter-Allied Foundries of New York State, secretary, Western New York Chapter.

Kundara's Farm was the scene for the picnic staged by the Western New York Chapter and from the smiles on the various faces it seems as though foundrymen enjoy spending their time on the farm. Top left: Past Western New York Chairmen McCallum (left) and Pohlman (right) exchange greetings. Center left (left to right): Frank McQuillen, Eliot Armstrong and M. A. Fisher seemed pleased about the day's affair. Center right (left to right): National Director W. J. Corbett, Alex Rankin and J. C. McCallum flash smiles as the shutter clicks. Right: Bert Weidel. Bottom left: Some of the Central New York gang came over to lend their support (left to right): H. H. Judson, director and past chairman; L. D. Wright, newly elected chairman; Frank Wheeler, past chairman, and A. Smith. Center: Part of 250 attending foundrymen. Right: Newly elected chairmen of their chapters (left): R. K. Glass, Western New York, and (right) L. D. Wright, Central New York.

(Photos courtesy R. K. Glass, Republic Steel Corp.)

Pittsburgh Foundrymen's Association holds annual outing.

(Photos courtesy R. L. Hartford, Penton Publishing Co.)

Barbecue Features St. Louis Outing

By Jack Kelin,* St. Louis, Mo.

JUST the sound of the word barbecue makes some people's mouths water, but just think what it did to the 200 foundrymen gathered at Joe Davie's Country Club for the St. Louis outing, June 14, when the odor of those spare ribs started to spread over the grounds. The most enjoyed indoor sport of the day was watching the spare ribs and waiting for them to be served.

For those who wanted a more exciting pastime the chapter provided such entertainment as baseball, horseshoe pitching and various other sports.

The good attendance was taken as an indication of increased interest in the chapter and chapter activities, and afforded foundrymen an opportunity to enjoy themselves thoroughly.

*Federated Metals Div., American Smelting & Refining Co., and secretary-treasurer, St. Louis District Chapter.

Philadelphia Holds Outing

By W. B. Coleman,* Philadelphia, Pa.

HOLDING one of the biggest outings yet, the Philadelphia Chapter enticed a good many foundrymen to spend a day of relaxation at the Hi-Top Country Club. There was plenty for everyone to do, as the golf course caused considerable amusement to many and the golfers, in turn, amused the bystanders.

Quoits and baseball helped to round out the day's activity. The highlight of the day was the baseball game, which saw the foundrymen win, 15-8.

*President, W. B. Coleman & Co., and Secretary-treasurer, Philadelphia Chapter.

Armstrong at Final Central New York Meeting

By L. D. Wright,* Geneva, N. Y.

FINAL monthly meetings of the Central New York Chapter were concluded June 13 at the Onondaga Hotel, Syracuse. Chairman Frank Wheeler, metallurgist, Kimman & Wheeler, had charge of the last affair.

Following the dinner the chapter elected unanimously these men as officers and directors for next year:

Chairman: L. D. Wright, superintendent, United States Radiator Corp., Geneva, N. Y.

Vice-chairman: N. H. Boardman, metallurgist, Elmira Foundry Co., Elmira, N. Y.

Secretary: L. E. Hall, superintendent, Chill Plow Co., Syracuse, N. Y.

Treasurer: E. G. White, plant engineer, Crouse-Hinds Co., Syracuse, N. Y.

Directors (elected for 3 years): Frank Wheeler, Kimman & Wheeler, Syracuse, N. Y. E. J. Bair, Sr., Utica Radiator Corp., Utica, N. Y. M. G. Hollembeck, metallurgist, Kennedy Valve Mfg. Co., Inc., Elmira, N. Y.

Program chairman, non-ferrous group: G. M. Thrasher, R. Lavin & Sons, Elmira, New York.

The speaker of the evening was Eliot Armstrong, general executive secretary, Inter-Allied Foundries of New York State, Buffalo, N. Y., and secretary, Western New York Chapter. His subject was "The Affect on the Foundry Industry of Recent National Legislation." Mr. Armstrong very frankly explained

*United States Radiator Corp., and secretary, Central New York Chapter.

Pictures of the Philadelphia outing reveal that the members really enjoyed themselves. Top: Five foundrymen gather to conduct their own round table discussion of various subjects. Bottom left: Pitchin' quoits. Bottom right: What's DiMaggio got that I aint got?

(Photos courtesy W. B. Coleman, W. B. Coleman & Co.)

the effect that recent social legislation, passed in Congress, would have on business. The speaker said that now is the time to put forth every effort to protect the foundry industry. All those present enjoyed the address and held an interesting discussion period talking about their various problems.

A motion picture entitled "Sand" was shown by V. L. Whitehead, Jr., Whitehead Bros. Co., which this company developed, depicting the growth and development of the sand industry.

"Old Timers" Reminisce at Southern California

By W. F. Haggman,*
Huntington Park, Calif.

CHAPTER President James Eppley, Kinney Iron Works, Los Angeles, had charge of the final meeting of the Southern California chapter, June 26, at the Elks Club, Los Angeles. Approximately 80 members and guests attended this meeting.

The program for the evening included several of the "old timers," including George Warman, Warman Steel Casting Co., Los Angeles, and William Campbell, Dayton Foundry Co., Hollydale. These men painted an interesting picture about old time foundries and foundry conditions that occurred in Southern California a few years ago.

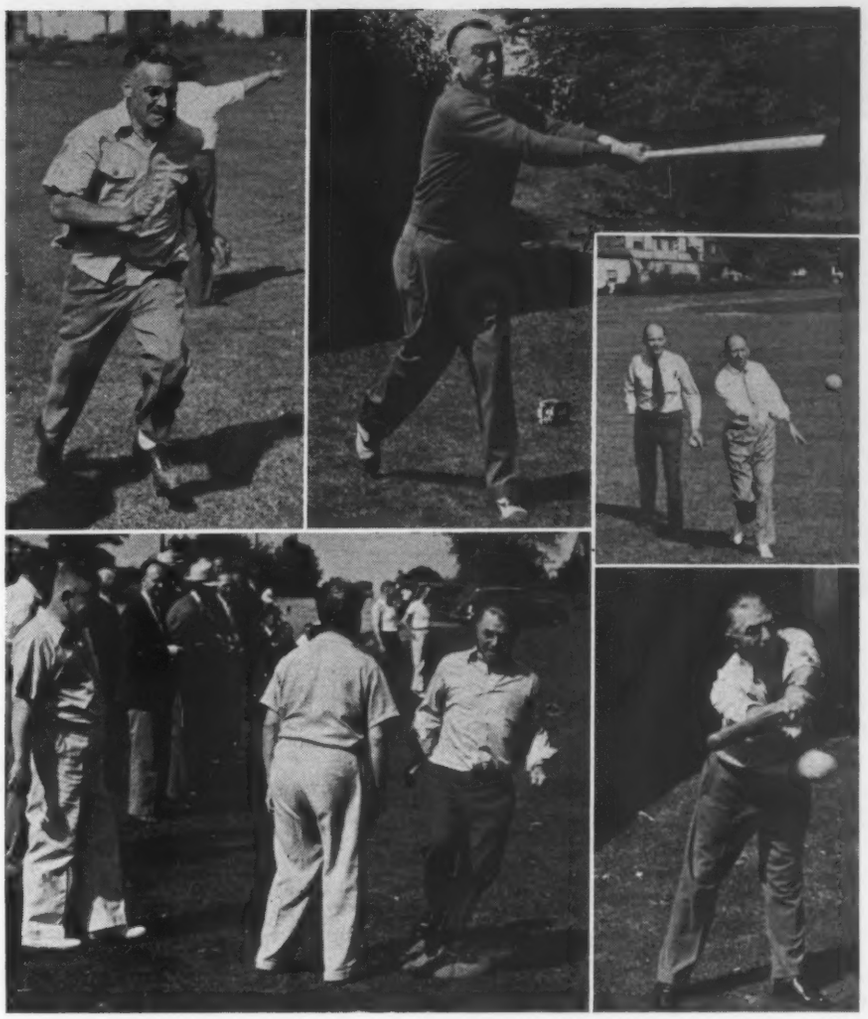
The movie picture "Sand," presented through the courtesy of Whitehead Bros. Co., was shown.

A ring was presented to President Eppley as has been the custom to do each year to the retiring chapter president.

President Eppley thanked the chapter and then presented the newly elected officers and directors as are shown on page 24, June, *American Foundryman*.

It was announced that the annual stag picnic would be held Saturday, August 2, at the Lakewood Country Club.

*Foundry Specialties Co., and Secretary, Southern California chapter.



At the Philadelphia Outing the action camera caught these fellows giving their all in the baseball game. Top left: Tearin' for the plate. Top right: What Ann Sheridan has—oomph! Insert: Ball ta. Lower left: He beat it out. Lower right: Reachin' for a wide one.
(Photos courtesy W. B. Coleman, W. B. Coleman & Co.)

Swing and Sway at Cleveland's Play Day

APPROXIMATELY 400 members and guests Northeastern Ohio Chapter, the largest number to date, attended the annual outing at Lake Forest Country Club, Hudson, Ohio, June 28. The temperature was unusually high, but that did not prevent participation in the list of games and pastimes usually provided on occasions of this character ranging in physical effort from that involved in tossing the baseball at bats to propelling a ball by a violent series of strokes to every one of 18 little holes located from 400 to 500 yards apart on a terrain apparently designed for the use of stalwarts with extensive hill climbing and mountain experience. At an elaborate chicken dinner which concluded the day's program an extensive list of prizes was distributed to heroes who had distinguished themselves by individual deeds of skill, daring and dexterity. Door prizes also were awarded to other members who had not risked their lives on the burning sands of the desert, but had spent the day on a shady veranda.

Among the golfers the first prize for low gross score was won by Dave Halub. Second prize won by Bruce Aiken, Crucible Steel Co. First prize for low gross on the first nine was won by Bob Wellman, *The Foundry*, and second prize was awarded Mike Thomas, City Foundry. On the low gross for the second nine Marcel Reymann, Atlantic Foundry, Akron, won first prize and J. E. Jackson

The Cleveland outing was a big success judging from the contentment shown on the many faces in these photographs.
(Photos courtesy S. N. Farmer, Sand Products Co.)

won second prize. G. D. Hayes made the highest gross score. Blind bogey prize winners included W. D. Dodge, Union Metal Mfg. Co.; H. J. Trenkamp, Ohio Foundry Co.; H. Doster, C. E. Furry, H. C. LeBeau, George Stewart, George Nestor and Russ Wenk. All agreed this was the best outing ever staged.

Essay Winners Receive Prizes

ATTENDING a recent Wisconsin Chapter meeting were five young college men, the first winners of the essay contest sponsored by the Wisconsin Chapter at Wisconsin and Marquette Universities. These five men were asked to be present to receive their prizes for the papers they had written concerning some phase of the foundry industry.

From Marquette University came Frank Brendler and Tom E. Armstrong, first and second prize recipients, respectively. Mr. Brendler's paper was entitled "Importance of Cost Determination in Modern Jobbing Foundries," while Mr. Armstong's paper concerned "A Discussion on the Substitution of Copper for Nickel in Making Alloy Cast Irons."

Wisconsin University's first place winner was Charles S. DeMont. His subject was "The How and Why of Foundry Practice." For second place there was a tie between Charles MacNeill and Charles W. Phillips. Mr. MacNeill wrote on the "Impressions of a Foundry Novice," and Mr. Phillips on "Melting Practice at the Vilter Mfg. Co. Foundry."

The first place winners were presented with $15 and the second placers $10 cash prizes. In the tie, the second place money was divided equally between the two contestants.

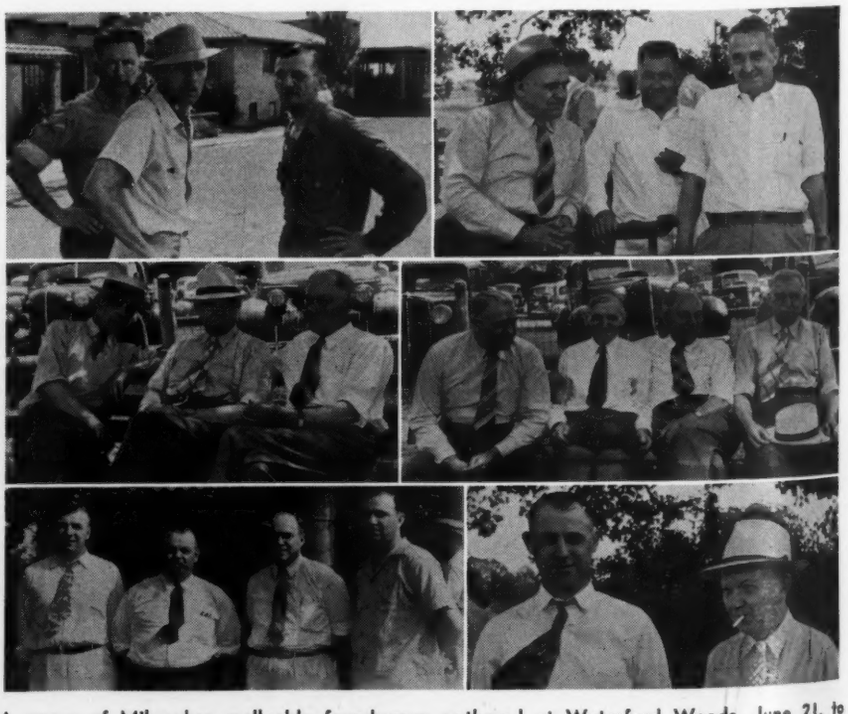
Chesapeake Aids Defense Training

(Concluded from Page 15)

more, Md., and "Molding and Foundry Practice of Malleable and Gray Iron Castings," by B. F. Drane, Kennedy Foundry Co., Baltimore, Md.

The instruction was given to the classes by G. O. Webster, instructor, Baltimore Polytechnic Institute, and T. C. Worley, assistant superintendent, iron and non-ferrous foundries, Bethlehem Steel Corp., Sparrows Point, Md.

The committee responsible for organizing and advertising this course is as follows: *Chairman,* Donald H. Lane, educational director, Bethlehem Steel Corp., Sparrows Point, Md.; Wm. C. Holtz, superintendent of foundry, American Brake Shoe & Foundry Co., Baltimore, Md.; Wm. C. Franz, manager, Flynn & Emerich Co., Baltimore, Md.; Fred C. Roemer, superintendent of foundry, Balmar Corp., Baltimore, Md.; James J. Lacy, president, James J. Lacy Co., Baltimore, Md., and Frederick G. Bruggman, sales engineer, The Gibson & Kirk Co., Baltimore, Md. Another course possibly will be started this winter.



A group of Milwaukee malleable foundrymen gathered at Waterford Woods, June 21, to hold a picnic of their own. These pictures help illustrate the "good time was had by all" angle.
(Photos courtesy John Bing, A. P. Green Fire Brick Co.)

The Wisconsin Chapter essay winners from Marquette and Wisconsin Universities. Left to right: Frank Brendler, first, Marquette University; Tom Armstrong, second, Marquette University; Charles Phillips, second, Wisconsin University; Charles MacNeill, second, Wisconsin University, and Charles DeMont, first, Wisconsin University.
(Photo courtesy John Bing, A. P. Green Fire Brick Co.)

1941 National Apprentice Contest Winners

HIGHLIGHTING the graduation exercises of the Cleveland Trade School, June 9, was the presentation of A.F.A. awards to National apprentice contest winners. Prizes to the boys who had won places in the gray iron, steel and non-ferrous molding contests were awarded by Walter Seelbach, vice president and general manager, Forest City Foundries Co., Cleveland. The patternmaking prizes were distributed by V. J. Sedlon, Master Pattern Co., Cleveland.

Those boys who received prizes were Chester Blacksmith, Bowler Foundry Co., second, gray iron molding; Bob Bina, Crucible Steel Casting Co., first, steel molding; John Jasso, Wellman Bronze & Aluminum Co., second, non-ferrous molding; John Burczky, Master Pattern Co., first, patternmaking, and Albert Jazbinski, Western Pattern Works, third, patternmaking.

John E. Fintz, supervisor of special schools, was the main speaker and Mr. Jameison, Board of Education member, handed out the diplomas.

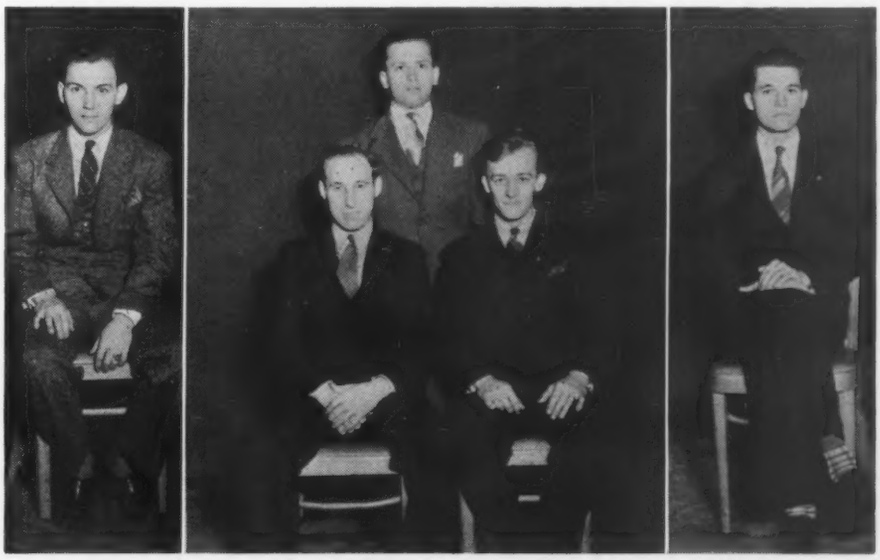
Three other boys won honors in the Association's apprentice contest and their pictures can be found on this page. They are: Henry L. White, Brown & Sharpe Mfg. Co., Providence, R. I., who won first prize, gray iron molding division; Pierre McMullen, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., who won third place, steel molding division; and Arthur Sirevoog, Miehle Printing Press & Mfg. Co., Chicago, Ill., second place, patternmaking division. We regret that the picture of Burton Bevis, Caterpillar Tractor Co., Peoria, Ill., who received third place, gray iron molding division, was not received in time for publication. The Wisconsin Chapter winners will be found on page 4.

Henry L. White, Brown & Sharpe Mfg. Co., Providence, R. I., first place winner, gray iron division, National Apprentice Contest.

Two other National Apprentice Contest winners. Pierre McMullen (left), Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., third place, steel molding division; and Arthur Sirevoog, Miehle Printing Press & Mfg. Co., Chicago, Ill., second place, patternmaking division.

O.P.M. Bans Tapioca Flour

THE Office of Production Management, Washington, D. C., is asking foundrymen and foundries throughout the country to forego using tapioca flour during the present emergency period. The OPM has contacted many foundries and has asked them not to use tapioca for cores and molds and has advised them that domestic corn starch has been found to be a satisfactory substitute.



Cleveland Trade School graduates that won prizes in the 1941 A.F.A. national apprentice contest. Left: John Burczky, Master Pattern Co., first, patternmaking. Center (standing): John Jasso, Wellman Bronze & Aluminum Co., second, non-ferrous molding. Sitting (left to right): Chester Blacksmith, Bowler Foundry Co., second, gray iron molding; Bob Bina, Crucible Steel Casting Co., first, steel molding. Right: Albert Jazbinski, Western Pattern Works, third, patternmaking.

Abstracts

NOTE: The following references to articles dealing with the many phases of the foundry industry, have been prepared by the staff of *American Foundryman*, from current technical and trade publications.

When copies of the complete articles are desired, photostat copies may be obtained from the Engineering Societies Library, 29 W. 39th Street, New York, N. Y.

Aircraft

See Non-Ferrous, Castings.

See X-Ray, Inspection.

Alloys

LEAD BASE BEARING. *"The Properties of Certain Lead-Bearing Alloys,"* by A. J. Phillips, A. A. Smith, Jr., and P. A. Beck, *A.S.T.M.,* 1941 *Preprint,* No. 46, pp. 1-8. A new lead-base bearing alloy containing approximately 12.5 per cent antimony, 3 per cent arsenic, 0.75 per cent tin, has been developed and its properties have been compared to those of conventional lead-base and tin-base alloys. At elevated temperatures, approximating those prevailing in automotive engine bearings, the tensile strength and Brinell hardness of the new alloy are considerably higher than those of the standard lead-base alloy and equal to those of the tin-base alloy. In addition, it retains its higher hardness over long periods of exposure to elevated temperatures, whereas the standard alloys show considerable softening under such conditions. The rotating-beam fatigue strength and the flexure fatigue strength of the new alloy at room temperature are superior to those of the standard bearing alloys. The properties of the new alloy indicate that it is superior to the lead-base and tin-base bearing alloys now in general use. Since tin is a strategic material, the new alloy promises to be of great interest because its use can decrease the amount of tin employed for bearing purposes. (Al.)

Aluminum Bronze

CORROSION. *"Influence of Stress on the Corrosion Pitting of Aluminum Bronze and Monel Metal in Water,* by D. J. McAdam, Jr., and G. W. Geil, *National Bureau of Standards, Research Paper RP*1366, February, 1941, pp. 1-42. Cyclic stresses tend to increase the sizes and sharpness of corrosion pits in aluminum bronze and monel metal and thus tend to increase the rate of lowering of the fatigue limit by corrosion. The form of corrosion pits in aluminum bronze is affected by the duplex microstructure. Pits in monel metal are not appreciably influenced by the microstructure. Curves of decrease of the fatigue limit, and constant damage diagrams derived from these curves are very different from those obtained with steels. These differences may be attributed to the fact that the rate of corrosion of aluminum bronze and monel metal, unlike that of steel, is anodically controlled. Steady stress tends to increase the rate of corrosion pitting of aluminum bronze but has little apparent effect on monel metal. (Al.)

Aluminum and Magnesium

CASTINGS. *"Light Alloy Castings,"* by A. E. Cartwright, *Canadian Metals and Metallurgical Industries,* vol. 4, No. 2, February, 1941, pp. 23-27. The two light alloy castings metals referred to in this article are aluminum and magnesium. First to be considered are the aluminum-base alloys being produced in the form of sand castings. The discussion of these castings are based upon practical experience in this type of production. Data on the production of magnesium castings is included. Pure aluminum is used for chemical and food handling equipment and as an electrical conductor. At present almost no commercial application, in the pure state, has been found for magnesium. The greatest recent demand for aluminum alloys of maximum quality has come from the aircraft industry. The casting alloys of aluminum, commonly used prior to the demand for high-duty and special-purpose alloys, are considered first. The author stated that it is practicable to obtain strength properties ranging from 50 to 100 per cent greater than those of the as-cast alloys by heat treatment of suitably controlled compositions. In the heat treatment of aluminum alloys the "solution" treatment is given and explained. The object of the treatment is to take into solution all the grain boundary constituent in the structure. Copper, silicon and magnesium are the chief elements that have been found useful in improving aluminum alloys by means of heat treatment effects, so the author stated. In discussing melting practice and foundry technique the author stressed that the methods of production of aluminum castings must, in every respect, be carefully planned and controlled. Absolute control of composition with close limits for impurities is vital to the attainment of the required specification properties for high duty alloys. Melting and casting temperatures are to be continuously controlled by pyrometer. The proportioning and locating of gates, risers and chills is a matter of vital importance and impossible to describe in all its ramifications. General principles of gating include the important one of filling the mold as rapidly as possible, consistent with avoiding turbulence of the stream. Few large gates are not desired. Feeding of the various sections of aluminum alloy castings is a vital consideration and any inadequacy in this matter is exposed on X-ray inspection. The use of chills is explained as they are used more frequently than for the heavier metals. Cores for aluminum alloy castings are made as weak as consistent with safe handling, owing to the hot shortness of most aluminum alloys. The grade of molding sand most suitable for production of these alloys is largely a matter of preference. Aluminum alloys are probably the most economically and practically adaptable of any, from the angle of X-ray control and inspection. (Al.)

Brass

DEZINCIFICATION. *"Comparative Value of Arsenic, Antimony and Phosphorus in Preventing Dezincification,"* by W. Lynes, *A.S.T.M.,* 1941 *Preprint,* No. 44, pp. 1-21. Early attempts to inhibit dezincification of alpha brasses culminated successfully in the introduction of a few hundredths of a per cent of arsenic. Later, antimony or phosphorus was used in similar amount for the same purpose. Laboratory tests are reported in this paper on 70-30 and admiralty brasses modified by an appropriate addition of each of the above elements. These tests indicate that dezincification of alpha brass alloys effectively may be suppressed by a small addition of arsenic, antimony or phosphorus, without impairment of the alloy. (Al.)

Bronze

See Aluminum Bronze, Corrosion.

Castings

ORDNANCE. *"Arsenal Makes Ordnance Castings,"* by Pat Dwyer, *The Foundry,* vol. 69, No. 6, June, 1941, pp. 54-55, 132-134. This article deals with foundry and related activities at the Rock Island Arsenal. A detailed account is given of the foundry concerning its operation, melting facilities, types of flasks used for molds, pattern storage and other items of interest. Herman Alex, superintendent and former Quad City Chapter Chairman, has been working for the government at this arsenal for nearly 50 years. (Ca.)

See Aluminum and Magnesium, Castings.

See Non-Ferrous, Castings.

Cast Iron

AUSTENITE. *"Isothermal Transformation of Austenite in Gray Cast Iron,"* by C. R. Hilliker and Morris Cohen, *The Iron Age,* vol. 148, No. 2, February 13, 1941, pp. 43-46. A study has been made of the isothermal transformation of austenite at sub-critical temperatures in two gray cast irons, one containing about 2 per cent nickel. Isothermal transformation curves for the two cast irons are given. As in the case of steel, nickel decreases the rate of isothermal transformation. The hardness of the isothermal products in both irons does not increase continuously with decreasing transformation temperature. The products formed between 950° and 850°F. are slightly, but definitely, softer than those formed on either side of this range. The microstructures of the transformation products are shown and their modes of formation briefly discussed. (C.I.)

FATIGUE. *"Fatigue and Static Load Tests of a High-Strength Cast Iron at Elevated Temperatures,"* by W. L. Collins and J. O. Smith, *A. S. T. M.* 1941 *Preprint,* No. 38, pp. 1-11. Repeated-load and short-time static-load tests of unnotched and notched specimens cut from large plates of one heat of a commercial high-strength cast iron are reported. Very little difference between the static ultimate strengths of unnotched and notched specimens could be observed at any temperature from room temperature to 1,100°F. The endurance limits for unnotched and notched, small transverse hole, specimens for completely reversed cycles of bending stress were determined for seven temperatures ranging from room temperature to 1,200°F. The endurance limits for both types of specimens were practically equal for the range of temperatures used, provided the net cross-section is used in computing the stresses in the specimens with the holes. The ratio of endurance limit to static tensile strength had an almost constant value of 0.40 for the entire range of temperature. (C. I.)

HARDENED CYLINDERS. *"Induction-Hardened Cylinder Bores,"* by F. P. Peters and E. F. Cone, *Metals and Alloys,* vol. 13, No. 6, June, 1941, pp. 713-722. Although some of the most brilliant accomplishments among recent metallurgical engineering developments have been in the field of surface-hardening, the problem of automatically producing an ultra-hard surface on cylinder bores has until recently not been satisfactorily solved. The Budd induction heating process, fully described for the first time in this article, is believed to offer the engineer at last the combination of properties he has long sought for many industrial cylinder-wear applications—non-spalling internal surfaces of up to 69 Rockwell C hardness integrally combined with tough, ductile, machinable body-material, and capable of fool-proof production at high rates of speed. The new process is of still greater interest in providing a new "material" and thus permitting designs not heretofore possible. Many of these new possibilities derived from the unique physical properties and machinability of the hardened surfaces, which themselves may be traced to certain unfamiliar metallurgical characteristics possessed by the treated metal—are discussed in this paper. (C. I.)

HEAT TREATMENT. *"Heat Treatment of Cast Iron in Machine Tool Industry,"* by J. W. Sands and D. A. Nemser, *Canada's Foundry Journal,* vol. 14, No. 5, May, 1941, pp. 22, 23, 24. Heat treatment of cast iron is not unusual. Heat treatments are varied but fall into four classifications; annealing, stress relieving, flame hardening and quenching and tempering. Each of these classes are discussed in detail. The quenching and tempering of cast iron gives added strength and wear resistance to parts of machine tools subjected to sliding contact. The function of annealing is to decompose the combined carbon and perceptibly soften the iron. Ordinarily annealing is a remedial measure aimed to restore machinability in chilled areas. Stress relieving insures stability during the subsequent machining and in service, minimizing any danger of gradual dimensional changes as a result of internal stress. The flame hardening process is the method by which selective hardening of wearing areas may be accomplished on parts which are too massive to heat treat easily in their entirety. (C. I.)

HIGH-DUTY. *"First Report of the Research Committee on High-Duty Cast Irons for General Engineering Purposes,"* by J. G. Pearce, *The Institution of Mechanical Engineers* (London), December, 1938, pp. 1-76. This paper is presented in three parts. Part 1 reviews the development of high-duty cast irons during the past 15 years. Part 2 is derived from materials actually supplied by manufacturers and designed to show the present state of the art. The third section gives some material covering the range of cast irons and their mechanical properties. It is hoped when the range is complete to select materials which show sufficient promise for complete mechanical property tests. (C. I.)

POLISHING. *"The Polishing of Cast-Iron Micro-Specimens and the Metallography of Graphite Flakes,"* by H. Morrogh, *Foundry Trade Journal,* vol. 64, No. 1,291, May 15, 1941, pp. 327-328. This paper is concerned exclusively with the preparation of gray cast iron. It is the purpose of this paper to point out that perfectly polished micro-specimens of gray or malleable cast iron can be obtained with the graphite intact; to give a description of the process used; and to indicate what parts of a general technique should be avoided if perfectly prepared specimens are to be obtained. A perfectly prepared micro-specimen of gray cast iron would have a metallic matrix polished free from scratches, and in this matrix would be graphite flakes also polished smooth and free from scratches, their surfaces being level with the polished metal surface. (C. I.)

PROPERTIES. *"Elastic Properties of Cast Iron,"* by A. I. Krynitsky and C. M. Saeger, Jr., *National Bureau of Standards, Research Paper RP*1176, February, 1939, pp. 1-16. An optical method for measuring the deflection of cast-iron transverse-test bars during loading and up to the breaking strength has been developed. Transverse-strength properties were determined on test bars made from 3 types of cast iron heated to the maximum temperatures of 1400, 1500, 1600 and 1700°C. Test bars were vertically cast bottom-poured in green-sand molds at 100, 150, 200 and 250°C. above the liquidus temperature. Total, plastic and elastic deflection; modulus of rupture; modulus of relative elasticity; and total, plastic, and elastic resilience were determined and the microstructure of the test bars were examined. (C. I.)

STRAIN HARDENING. *"The Strain Hardening of Gray Cast Iron,"* by J. S. Peck, *A. S. T. M.* 1941 *Preprint,* No. 39, pp. 1-4. Information in this paper shows the effect produced upon the Rockwell hardness of gray cast iron by compressive loads of increasing intensity. Specimens of gray cast iron, 1-in. square and ½-in. high were used. The Rockwell B hardness of each specimen was obtained prior to loading by averaging 64 readings, 16 on each face. The specimens were then subjected to compressive loads, increasing by increments of 10,000 lb. per sq. in. and their Rockwell hardness obtained again. The change in hardness was computed and the results plotted. In order to investigate the possible effect of the height of the specimen on the results, a series of check tests were run using specimens 1, 1½, 2 and 3-in. in height, respectively. No material effect was seen. The data show that up to about 40,000 lb. per sq. in. the Rockwell B hardness increased slightly. From 40,000 to 60,000 lb. per sq. in. no significant change in hardness was observed. From 60,000 lb. per sq. in. to failure the Rockwell B hardness decreased rapidly. (C. I.)

TESTING. *"A Deflectometer for Transverse Testing of Cast Iron,"* by C. T. Greenidge and E. C. Kron, *Metals and Alloys,* vol. 13, No. 6, June, 1941, pp. 723-725. Realizing that an inexpensive method of obtaining autographic transverse load-deflection curves would be highly desirable, the authors present a solution of the problem—a deflectometer. This new device gives a permanent record and needs only one man to make the test. The wedge principle was applied to this case. The movement of a wedge, which is some multiple of the movement of the two halves of an extensometer, offers a simple means of measuring and multiplying the movement of the extensometer in the same operation. The deflectometer itself consists of a tube through which a rod slides. One shoe is fastened to the sliding rod and a second to the tube itself. Each shoe has two grooves in which the two wedges slide. The transverse bar rests upon the two supports attached to the moving head of the testing machine, and the rod of the deflectometer is held against the under side of the bar by a spring so that, at the start of the test, the various parts are in position. As the head of the testing machine moves upward, the transverse bar is gradually bent until it breaks. (C. I.)

See Committee Report, Oxygen.
See Irons, Automotive.

Ceramics

COLLOID CHEMISTRY. *"Colloid Chemistry in Ceramics,"* by E. A. Hauser, *American Ceramic Society Journal,* vol. 24, No. 6, June, 1941, pp. 179-189. This is the Edward Orton, Jr., Memorial Lecture presented at the Forty-third Annual Meeting, The American Ceramic Society, Baltimore, Md., March 31, 1941. This report gives in simple form a few fundamental colloid chemical and physical concepts which have a direct bearing on basic problems in ceramics. Of special interest to foundrymen is the report within this lecture concerning the kaolin group, of which the kaolinite is the most common member; the montmorillonite group and the illites; and their properties. (Sa.)

Clay

WATER SYSTEM. *"Fundamental Study of Clays II, Mechanism of Deflocculation in the Clay-Water System,"* by A. L. Johnson and F. H. Norton, *American Ceramic Society Journal,* vol. 24, No. 6, June, 1941, pp. 189-203. The effect of bases, basic salts, neutral salts, acid salts, and acids on the viscosity of clay slips cleaned as described in Part I of this study is shown. From these data, a fundamental theory of deflocculation is built up, based on the fact that deflocculation requires the presence of OH anions and monovalent cations. The influence on the viscosity of small traces of soluble salts or absorbed ions, which are present in commercial clays, is discussed. It is also shown why sodium silicate or carbonate works more satisfactorily than sodium hydroxide in the deflocculation of commercial casting slips. (Sa.)

Cleaning

See Riser, Removal.

Committee Report

OXYGEN. *"Third Report of the Oxygen Sub-committee," Foundry Trade Journal,* vol. 64, No. 1,290, May 8, 1941, pp. 317-318. Two further reports emanating from the British Cast Iron Research Association are the two papers presented in this article: *"The Determination of Total Oxygen in Pig-Iron by the Aluminum Reduction Method,"* by E. Taylor-Austin and *"The Present Position of the Determination of Oxide Inclusions in Pig-Iron and Cast Iron,"* by J. G. Pearce. The first paper gives a successful method that has been applied to a series of gray-pig-irons. The determination of total oxygen in pig-iron was made and it was found necessary to modify the original procedure in order to avoid interference from silicon. The second paper by Mr. Pearce pertains to inclusions in cast iron and pig-iron and are of as much interest metallurgically as are those in steels, but not entirely for the same reason. Present consideration is confined to solid, and to inherent, as distinct from foreign, particles, although a sharp distinction between them is difficult to draw. (C. I.)

Copper

FATIGUE TESTS. *"Fatigue Tests on Some Copper Alloys,"* by A. R. Anderson and C. S. Smith, *A. S. T. M.* 1941 *Preprint,* No. 43, pp. 1-9. This paper presents the results of short-specimen rotating-beam endurance tests on commercially fabricated rods of tough pitch and oxygen-free copper and 15 copper alloys, including precipitation hardening types. Endurance strengths, at 300 million cycles, are tabulated, together with pertinent data on composition, fabrication and tensile properties, while the experimental data are presented in the form of S-N curves. The results are briefly discussed and the fatigue machine, preparation and specimens and testing technique are described. (Al.)

PROPERTIES. *"The Tensile Properties of Some Copper Alloys,"* by C. S. Smith and W. Van Wagner, *A. S. T. M.* 1941 *Preprint,* No. 42, pp. 1-21. Tension tests performed on copper and 12 copper alloys in the form of commercially fabricated rods, using an extensometer sensitive to 0.0001 per cent are discussed. Typical stress-strain curves are reproduced, together with curves showing offset and permanent set on a large scale, both before and after over-straining in tension. Overstrain decreases the stress first producing measurable offset in annealed alloys, but increases the stress needed to produce an equivalent set. Heat-treated beryllium copper follow Hooke's law to nearly 100,000 lb. per sq. in. if appropriate corrections for true stress and strain are made. (Al.)

Cupola

MELTING LOSS. *"Cupola Melting Loss,"* by E. A. Fisher, *Pig Iron Rough Notes,* vol. 84, Spring, 1941, pp. 22-25. This report gives a survey of some of the estimates made by foundrymen and metallurgists concerning their opinions of melting losses of pig iron, machinery scrap, stoveplate and other metal. The author states that cupola losses of great percentages are not necessary. The remedy for reducing excessive melting-loss lies with the individual foundrymen, the high spots of the cure being based on closer supervision and more attention to all the details of weighing, charging and melting—with special attention to the amount of air delivered—to the coke bed-height, and the coke between charges. The author has observed that his losses occur during the last thirty minutes of the heat, when all conditions are unfavorable to good melting. Losses at this time exceed 3 or 4 per cent. (F).

Design

FORM AND SCALE. *"The Influence of Form and Scale on Strength,"* by R. J. Roark, R. S. Hartenberg and R. Z. Williams, *Bulletin of the University of Wisconsin, Engineering Experiment Station Series No.* 84, 1938, pp. 1-55. This investigation was undertaken for the purpose of securing data that could be used to advantage in calculating the strength of structural elements made of brittle material. The immediate objectives were: the determination of the factor of stress concentration at rupture for each of a number of brittle materials, and for each of a variety of form irregularities and; the determination of the rupture factor and the form factor for each of several types of structural parts made of cast iron, and for corresponding plaster molds. Brittle materials means materials in which failure consists in rupture rather than in excessive plastic yielding. Cast iron, various cast alloys, and concrete were included as representative structural materials. Tests were also made on plaster and bakelite. The form and dimensions of the specimens used and the manner in which each kind was tested is discussed. The specimens represent conventionalized types of form irregularities, and the tests were intended to yield information on the notch sensitivity of the various materials under tension, bending, compression, and torsion, and under static, impact and repeated loading. (Ca.)

STRENGTH. *"Predicting the Strength of Structures From Tests of Plaster Models,"* by R. J. Roark and R. S. Hartenberg, *Bulletin of the University of Wisconsin, Engineering Experiment Station Series, No.* 81, pp. 1-51. The best way to obtain the strength of a structure is to test the structure itself, or a duplicate, to failure, under conditions, as nearly as possible, identical with those of service. As a substitute measure, the test of a scale model, made of some weaker and more easily fabricated material, suggests itself. In principle, this method would comprise the following steps: (1) determination by test of the load P_m carried by a scale model 1/n times as large as the structure; (2) determination by tests on suitable coupons of R, the ratio of the ultimate strength of the structural material to the ultimate strength of the model material; (3) calculation of the predicted load that the structure would carry by the relation $P=P_m \times n^2 \times R$. To receive satisfactory results from so simple a procedure would require certain relationships between the structural and model materials; in particular, the strength ratio R should be the same for all kinds of stress likely to be critical, and the materials should respond similarly to the influence of form and strength. It is shown that by judicious selection of the model material these requirements can be met reasonably well, and that correction factors can be introduced to compensate for unavoidable discrepancies. This investigation was undertaken to investigate the practicability of this method of strength prediction, and to contribute something toward the development of a satisfactory technic for its application. A grade of commercial gypsum plaster was adopted as the model material. Duralumin wire was used in reenforced concrete structures. A special testing machine, designed and built for the purpose of testing models and model material, is also described and illustrated. Tests were made on the model material, to ascertain the effect of various factors, such as age, surface condition and rate of loading. The tests on model and structural materials are described in detail. Comparative tests of structures and models are described. Tables show, in general, the form and dimensions of the test specimens and the method of testing. (Ca.)

Desulphurization

BLAST FURNACE. *"Desulphurization With Alkali,"* by R. H. Sweetser, *The Iron Age,* vol. 147, No. 22, May 29, 1941, pp. 31-35. In this particular research problem, both the steel makers and the alkali makers wanted to find out if it were economically and metallurgically practical to make high grade steel out of hot metal that had been desulphurized outside the blast furnace with soda ash instead of inside the blast furnace with limestone; also, how much more pig iron would a blast furnace make on "lean slag" practice than on the normal slag. Observations of "normal practice" were started late in September and were continued for a month, when the furnace was thrown over to "lean slag" practice by reducing the amount of limestone in the burden and deliberately making high sulphur pig iron. A brief resume is presented of three papers written by men who had cooperated in making the tests for this study and make interesting reading. The conclusions of their papers seem to agree that desulphurization is practical in American practice. (F.)

Foreman Training

WAGNER ACT. *"New Wagner Act Problems Face Management,"* by Russell Greenman, *Supervision,* vol. 3, No. 1, January, 1941, pp. 7-8. The Wagner Act gives employees the right to be let alone in their decisions regarding union affairs—that is, let alone by their bosses. Since foremen might be committing a federal offense by "airing" their opinions on organization problems, foremen should go mighty slow in letting his employees know what he thinks on the subject of unionization. Under the Wagner Act supervisors apparently are not ever supposed to think or care anything about this subject. (Tr.)

Furnace

See Cupola, Melting Loss
See Desulphurization, Blast Furnace
See Steel, Bessemer Process.

Gating

See Non-Ferrous, Gating.

Heat Treatment

See Cast Iron, Austenite.
See Cast Iron, Hardened Cylinders
See Cast Iron, Heat Treatment.
See Cast Iron, Strain Hardening.

Irons

AUTOMOTIVE. *"Plain and Alloyed Irons Used in Automobiles,"* by Harold S. Austin, *Metal Progress,* vol. 39, No. 6, June, 1941, pp. 697-701. This article discusses types of irons used in considerable quantity in automobiles. The irons used in automotive castings may be grouped into six general classes. These six classes are: (1) cylinder iron, (2) small iron parts, (3) heat and growth resisting iron, (4) high test gray iron, (5) piston ring iron, and (6) miscellaneous borderline compositions such as used in camshafts, cylinder

liners, valve seat inserts and crankshafts. These six classifications are discussed in detail. (C.)

Magnesium

See Aluminum and Magnesium, Castings.

Malleable

MODULUS OF ELASTICITY. *"Young's Modulus of Elasticity and Some Related Properties of Graphitic Materials,"* by H. A. Schwartz and C. H. Junge, *A. S. T. M.* 1941 *Preprint,* No. 40, pp. 1-8. Young's modulus of elasticity, density, resistivity and coercivity of a fairly extensive series of alloys comprising ingot iron, steel, graphitizable steel, white cast iron, malleable and pearlitic malleable cast iron, and gray cast iron were determined and correlated with chemical composition and heat treatment with special emphasis on the combined and graphitic carbon content. Consideration is given to the relative consistency of results of various evaluations of Young's modulus of elasticity. An extremely close correlation between density and modulus of elasticity is demonstrated, the correlation being closer than that of Young's modulus and graphite content. A metallurgical explanation giving a new demonstration of the relative solubility rate of graphite and cementite is offered. (Ca.)

Melting

See Cupola, Melting Loss.

Metallography

See Cast Iron, Polishing.

Non-Ferrous

CASTINGS. *"Manufacturing Non-Ferrous Sand Castings for Aircraft,"* by Robert E. Ward, *The Foundry,* vol. 69, No. 5, May, 1941, pp. 80-83, 175-176. One of the pioneers in the development of aluminum and magnesium sand castings for aircraft use is the Eclipse Aviation Foundry, Bendix, N. J. Development of the foundry was brought about by the Eclipse Aviation division, Bendix Aviation Corp., expressly to provide a controlled source of aircraft quality non-ferrous castings to be used in the manufacture of Eclipse aircraft accessories. The foundry building includes separate departments for pattern-making and storage; sand and raw material storage; core making and baking; molding; melting; cleaning and surface treating; inspection and shipping; and an enclosed office space. In manufacturing sand castings from different alloys the problem of proper identification and separation of the sand, metal and castings is very great. To facilitate classification, the foundry is divided into three sections for melting and casting of aluminum, magnesium and copper base alloys, and those departments further are subdivided for making different alloys of those base metals. Molding sands are stored in the temperature-controlled plant, and kept in separate bins. The sand is transported to the benches by hand trucks where they are mixed to suit the requirements of the metal. Tests are frequently made on each heap for moisture content, permeability, strength and other properties. The molding department is divided into two parts—hand or machine rammed. To meet manufacturing specifications, the alloys must be made of virgin metals. Only one alloy of magnesium is cast in the fonudry. The castings are marked after removal from the molds, along with gates and risers which are tagged following their removal, so as to eliminate any mix-up as to the composition of the risers, or the melt numbers of the castings. Then follows a solution treatment and shot blasting for the aluminum and magnesium castings which is described briefly. After the shot blast the castings are given a corrosion protective coating. (N.F.)

GATING. *"Gating Non-Ferrous Castings Is Important,"* by N. K. B. Patch, *The Foundry,* vol. 69, No. 5, May, 1941, pp. 92-93, 172-174. In other articles on this subject the author has tried to show the advisability of careful study of gating and to convince readers of economies to be derived from such a study. Importance is placed in this section of the paper on leading the metal into the mold in the right direction to develop the proper heat gradient so that cooling and solidification will take place at the proper rate and in the proper location to insure proper feeding. With the aid of numerous sketches the author illustrates how different forms of gating can solve various problems encountered in the making of small castings. These drawings also reveal new and improved ways of gating castings. Another interesting note is the author's discussion of gating bells. Large bells, running from the locomotive bell up, usually are cast with the mouth down and sometimes poured from the top. Castings made up of round parts connected with flat parts should be considered carefully when studying the proper location for gates and for feeding risers. (N.F.)

GATING. *"Gating Non-Ferrous Castings Is Important,"* by N. K. B. Patch, *The Foundry,* vol. 69, No. 6, June, 1941, pp. 52-53, 128-130. The detail of the size and shape of gate only has been suggested in previous articles by the author, and yet the subject of the shape and size is a very vital one, particularly as related to the different types of metals cast. It is only the resistance to the possible destruction or harm to the mold cavity that governs the force permissible, thus establishing the size and shape of the gates. It frequently happens that a number of gates are provided for the entrance of the metal to the mold but the amount of metal that can pass through the sprue or through the runner is not sufficient to completely fill all of these several gates at the same time. Continuing the author states that in the case of some other compositions commonly cast in the non-ferrous foundry an important factor in the making of good castings in those compositions is the necessity of quiet entrance of metal. In general it should be the rule to have the gates big enough to provide a free flow of metal and avoid restrictions in these gates at the mold entrance so that there is no tendency to squirt or form a jet. Sharp corners should be avoided. The feeding of red brass test bars gives them a high tensile strength and good elongation, states the author. (N.F.)

See Alloys, Lead Base Bearing.
See Aluminum Bronze, Corrosion.
See Brass, Dezincification.
See Castings, Ordnance.
See Copper, Fatigue Tests.
See Copper, Properties.

Refractories

See Steel, Open-Hearth Refractories.

Risers

REMOVAL. *"Lancing a 7-Ton Riser," Canada's Foundry Journal,* vol. 14, No. 5, May, 1941, p. 7. A pictorial study of the removal of a 7-ton riser from a 9-ton crusher casting. This job was done with an oxygen lance, aided by a cutting blowpipe, and made short work of this unusual job. The pictures show how the job was set up, the start, operation, the finish and the result. (Ca.)

Sand

See Ceramics, Colloid Chemistry.
See Clay, Water System.

Steel

BESSEMER PROCESS. *"Photocell Control for Bessemer Steelmaking,"* by H. K. Work, *Metals Technology,* vol. 8, No. 4, June, 1941, pp. 1-19. This discussion has been limited as it deals with the acid Bessemer process in bottom-blown converters, although much of the information is applicable to basic and side-blown converters. The author states that Bessemer steel is actually superior to open-hearth for many applications. However, there are definite metallurgical limitations to the use of Bessemer steel, resulting largely from two factors: (1) the physical properties conferred by nitrogen and phosphorus, and (2) the variability from blow to blow. A method of controlling the Bessemer steelmaking process by means of photocells is described. This practice gives a rapid and quantitative indication of changes in the flame, which are recorded graphically for each blow. The interpretation of these curves is discussed and procedures for applying the control practices are shown. (S.)

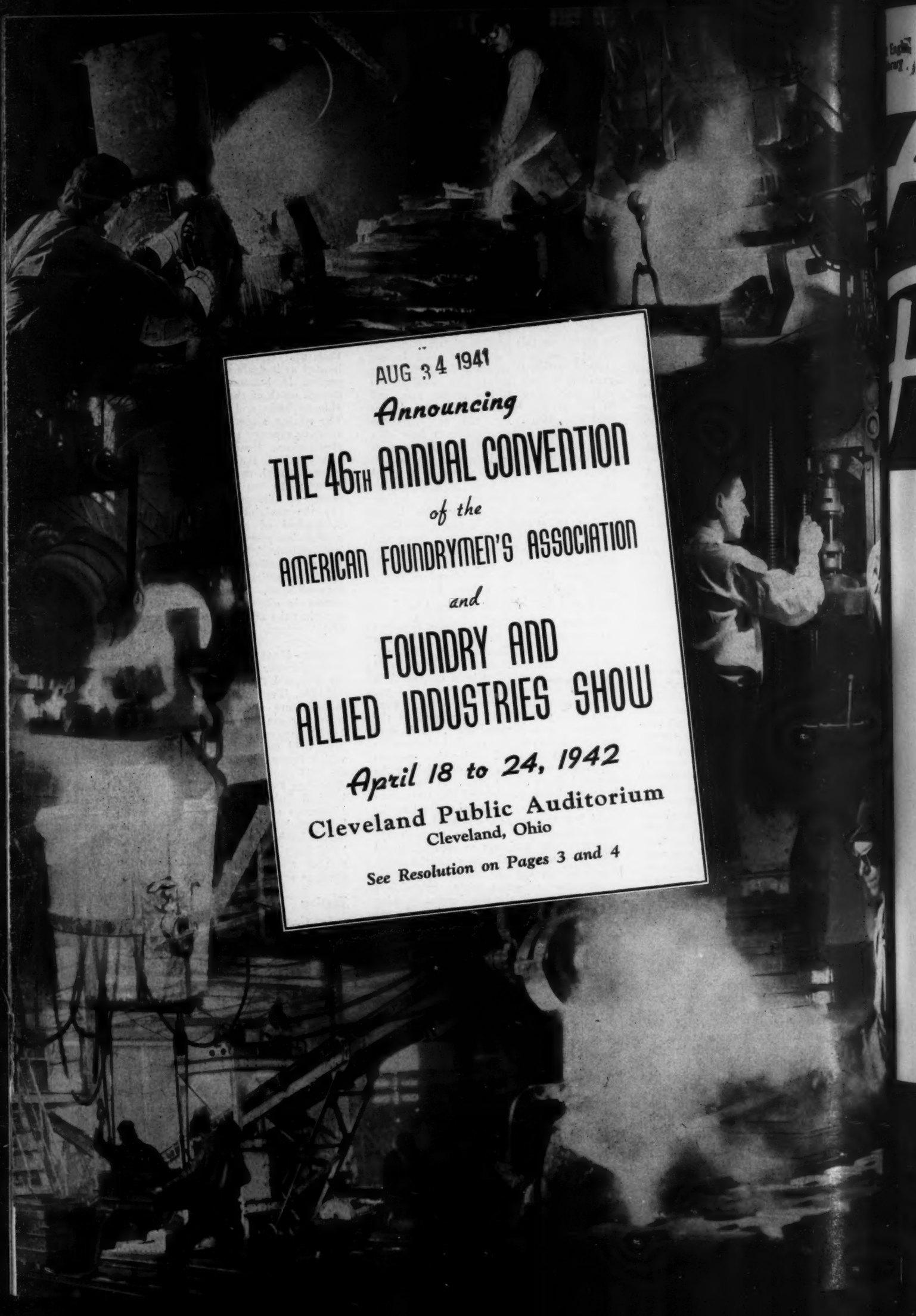
OPEN-HEARTH REFRACTORIES. *"Refractories for the Open Hearth," Industrial Heating,* vol. 8, No. 5, May, 1941, pp. 540, 542, 544. Trends and developments in the manufacture and applications of refractories for use in the acid and basic open hearth processes were discussed at the joint acid and basic open hearth session which formed a part of the program of the 1941 Annual Open Hearth Conference, American Institute of Mining and Metallurgical Engineers, Chicago, April 23-25. Numerous new trends are given with a brief explanation of each new development. Such items as use of basic brick, basic front walls, suspended roofs, insulation of open hearth furnaces and other features are discussed. (S.)

Testing

See Cast Iron, Fatigue.
See Cast Iron, Testing.
See Copper, Fatigue.
See Design, Form and Scale.
See Design, Strength.

X-Ray

INSPECTION. *"Inspection of Aircraft Components,"* by R. C. Woods and T. M. Nolan, *The Iron Age,* vol. 147, No. 24, June 12, 1941, pp. 47-49. In the aircraft field, the x-ray has come into its own. Almost every foundryman is acquainted with the benefits he can derive from x-ray examination. Foundrymen realize that they have increased the value of their product to such a degree that castings now can be used in many places where they could heretofore not be used due to the uncertainty of specific types. The authors show how the x-ray laboratory can solve many unusual and difficult production problems. (Te.)



AUG 3 4 1941

Announcing

THE 46TH ANNUAL CONVENTION

of the

AMERICAN FOUNDRYMEN'S ASSOCIATION

and

FOUNDRY AND ALLIED INDUSTRIES SHOW

April 18 to 24, 1942

Cleveland Public Auditorium
Cleveland, Ohio

See Resolution on Pages 3 and 4